OCTOBER 14, 1960 ONE SHILLING AND SIXPENCE

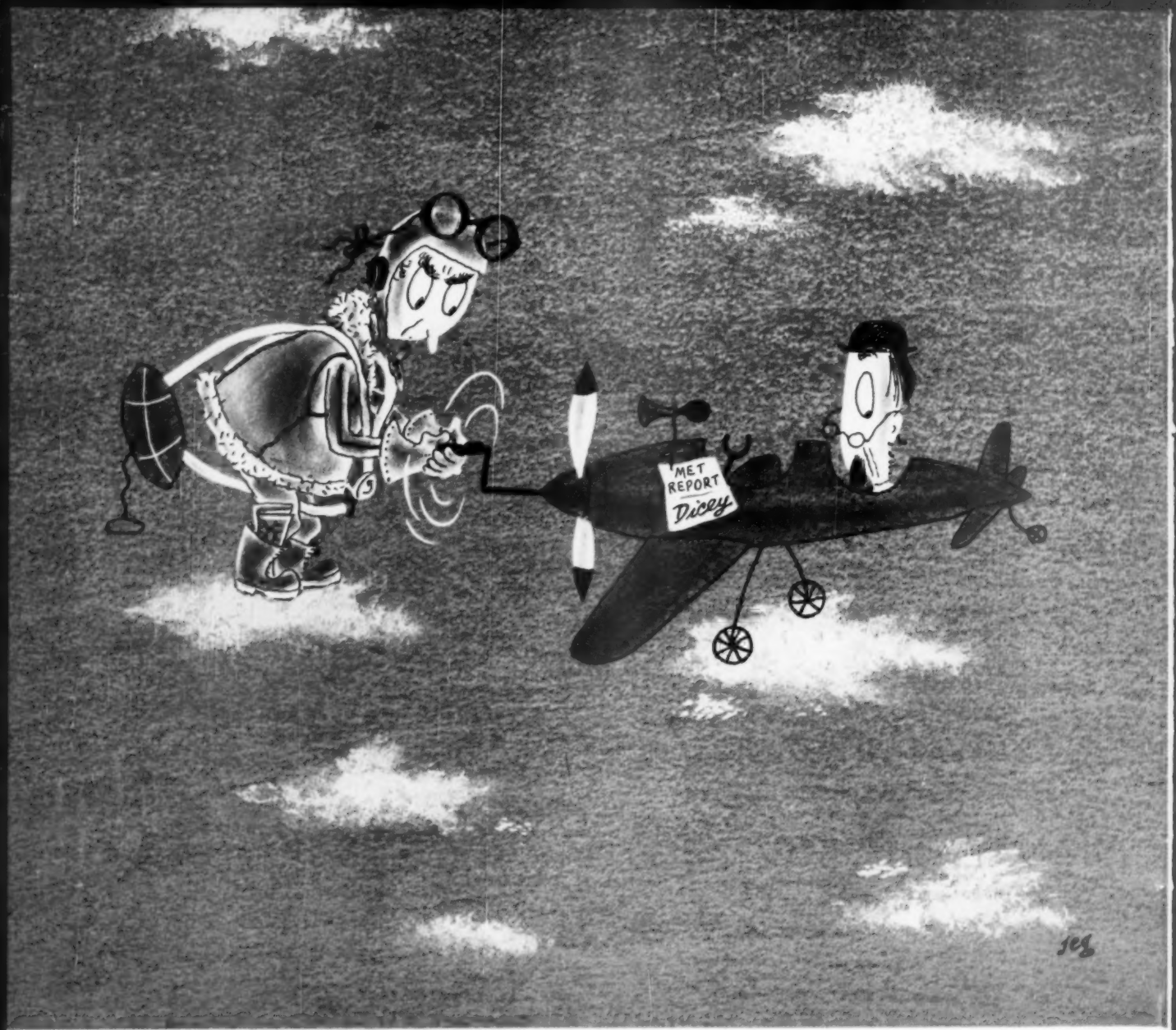
THE AEROPLANE and ASTRONAUTICS

AIRPORT INSTALLATIONS and CARGO HANDLING

15,000 feet above the Farnborough crowd, test pilot Bill Bedford threw the red Hunter two-seater trainer into a spin. Falling 10,000 feet in fifty seconds he corkscrewed 12, 13, 14 times — then regained perfect control.

"You saw for yourself" he said, "how hard it was to get into a spin, you have to be really brutal. But in training, we have got to be able to teach pilots how to spin and how to get out of a spin — just in case."

HAWKER SIDDELEY AVIATION *32 Duke Street, London, S.W.1.*



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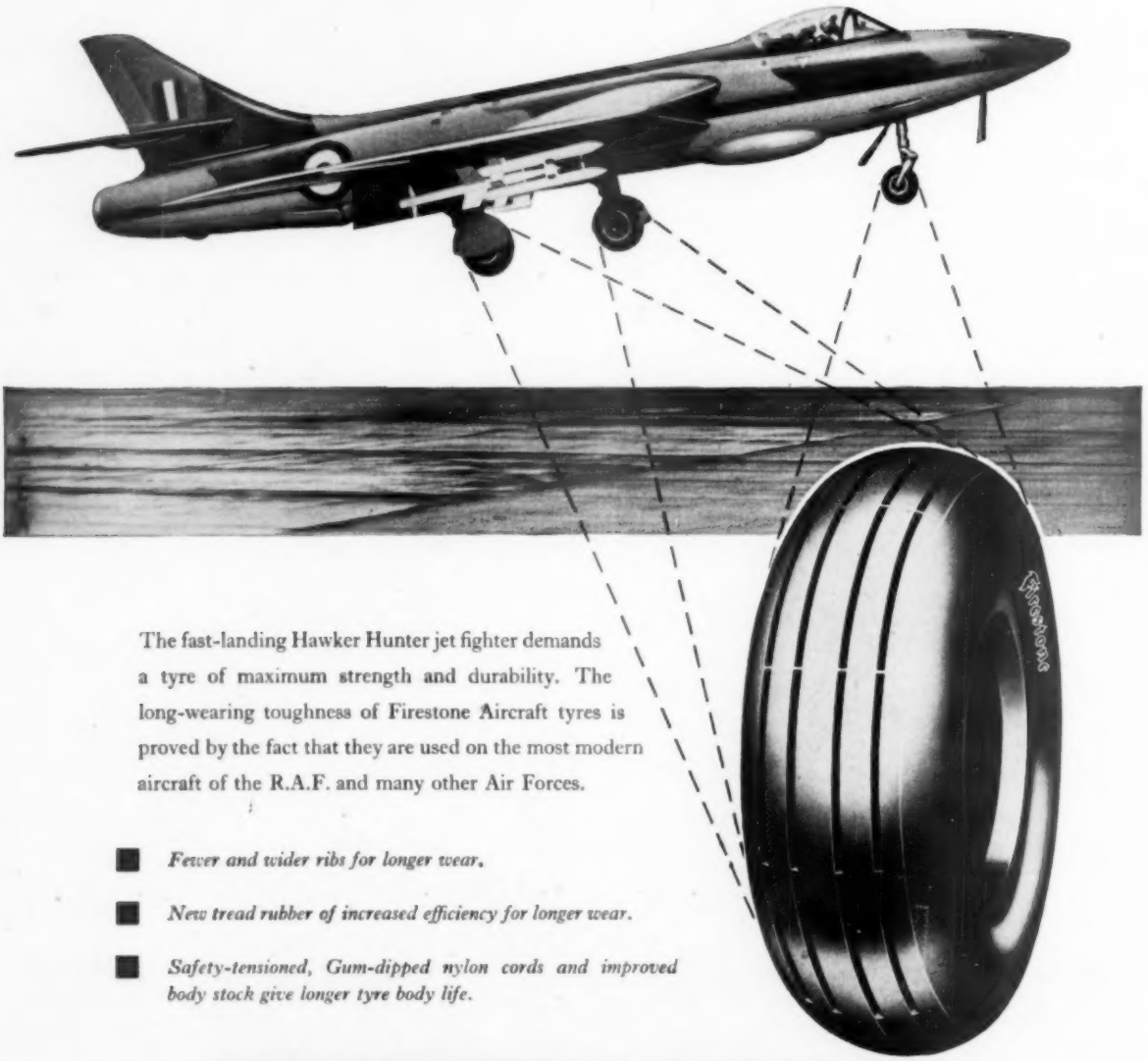
A

Here's proof of Firestone *Long-wearing toughness!*



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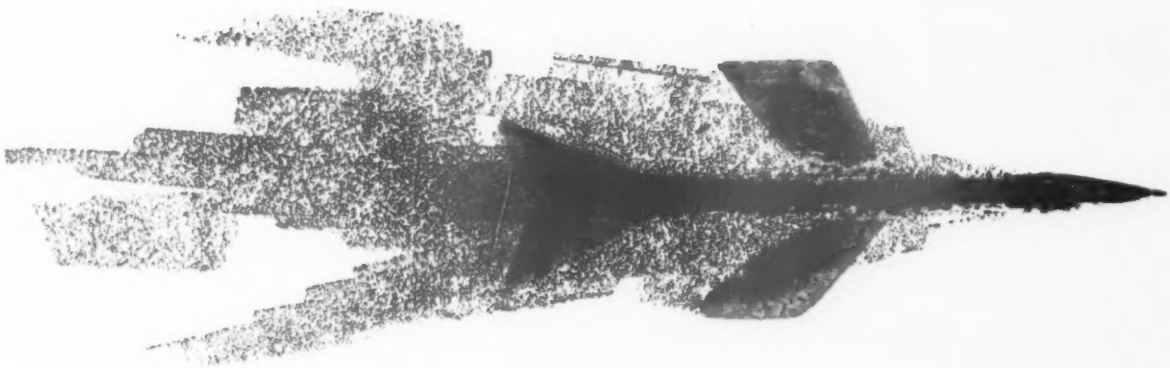

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* *Ferranti are also producing a radar for the Royal Navy's Blackburn NA.39 Strike Aircraft.*

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This is the type of flexibility that will answer the many and varied problems confronting airline operators who, because of the growing demands of shippers, are being forced to provide a combination of short, medium and long range air cargo services for the carriage of freight at attractive and competitive tariffs. In this situation, the Canadair Forty Four offers excellent economy and earning ability over the complete range of route structures that must be provided in the collection and distribution of air cargo.

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The need for this system of short, medium or long range operations will develop through the growing awareness among business establishments that the carriage of articles by air is becoming an essential element in the overall marketing function. This will open up new markets, new transportation requirements, new inter-city services. The Forty Four, with its flexibility of performance, can carry cargo at a profit over the whole distance spectrum—short, medium and long range, and has the airfield performance characteristics to get in and out of 85% of the world's major airports. THESE ARE DECISIVE ADVANTAGES IN FAVOUR OF THE FORTY FOUR.

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1. From runways as short as 6,000 feet, can operate with 70% payload up to stage distances of 3,000 miles.
2. Can operate from 85% of the world's major airports, with due consideration to both runway length and allowable wheel loading.
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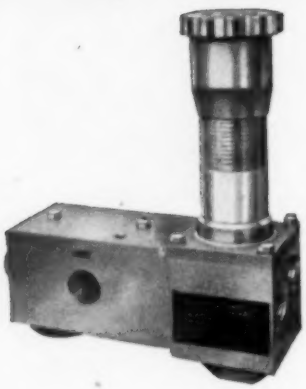

Experienced engineers at HML are always ready to get to grips with problems arising from the design requirements of modern hydraulic systems. You'll find HML Ministry approved units and components used and relied upon wherever high standards of performance are recognised.

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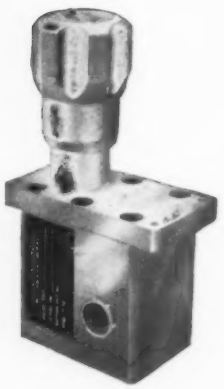
The only pressure reducing valve on the market today that will maintain set reduced pressure under varying pressure and flow conditions. Pressure range 0-5000 p.s.i. Flow range 0-10 g.p.m.



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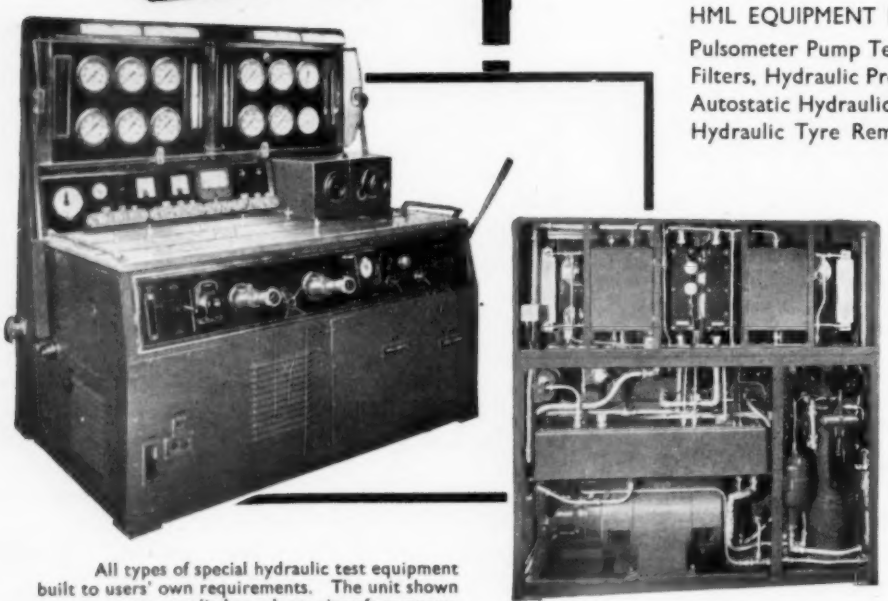

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This spring, the Northrop T-38 Talon jet trainer will become fully operational with the U.S. Air Force Air Training Command. Before long, all U.S. Air Force pilots who learn to fly beyond Mach 1 will do so in T-38 Talons.

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STAN 7-8 *CHOSEN FOR LONDON AIRPORT*

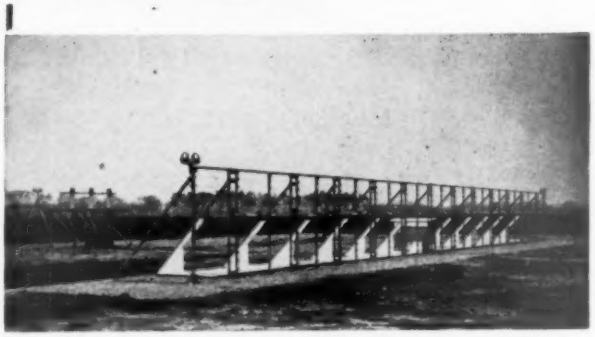
Dual STAN 7-8 High Accuracy Instrument Landing System specified for installation at London Airport. This equipment, which has automatic cut-over facilities, has been designed to provide an improved performance by use of a dual beam Localiser (STAN 7) in order to reduce substantially the effects of site imperfections.

The required 90 and 150 c/s modulations are derived from double sideband mechanical modulators whose input impedance is substantially constant and provide signals free from phase modulation.

The equipment is extensively transistorised and one Dual Localiser with one Dual Glide Path equipment contains only 28 valves (14 working).

STAN 7 LOCALISER EQUIPMENT
STAN 8 GLIDE PATH EQUIPMENT

Dual Beam Localiser reduces the effects of site errors
Freedom from false courses
360° omni-directional information
Reliable fail-safe monitoring fully transistorised
Independent setting-up controls
Improved servicing and fault location facilities
Mains supply, single-phase 100-120V or 200-250V 45-65c/s



The STAN 7-8 is in quantity production for the Ministry of Aviation and the STAN 7-8-9 which includes the marker has been specified by Radio Suisse for Zurich Airport and by the Régie des Vois Aériennes for Brussels Airport.

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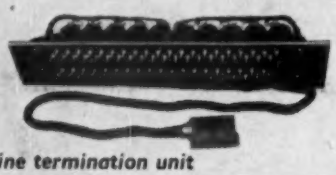
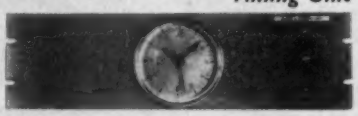


Line termination unit

Timing Unit



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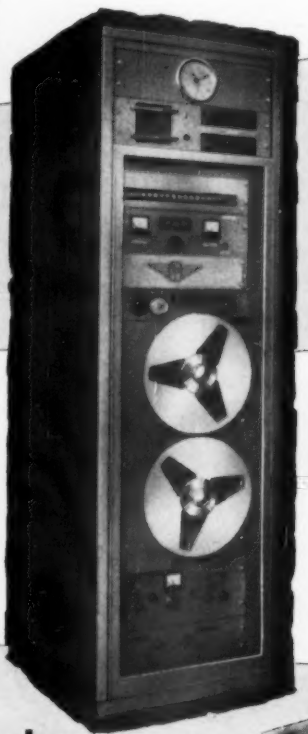
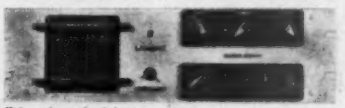
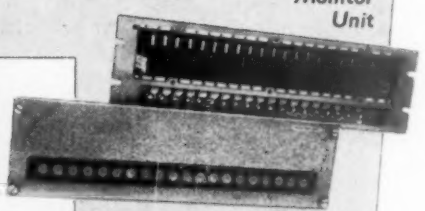




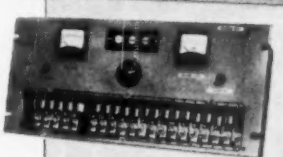
Playback Unit

range of

Monitor Unit



Record Unit



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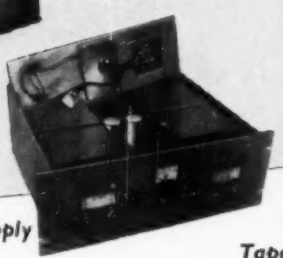
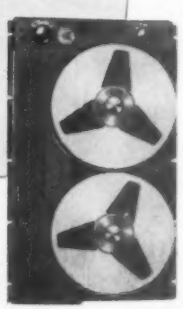
Blower Unit

...a recorder to your specification



Power Supply Unit



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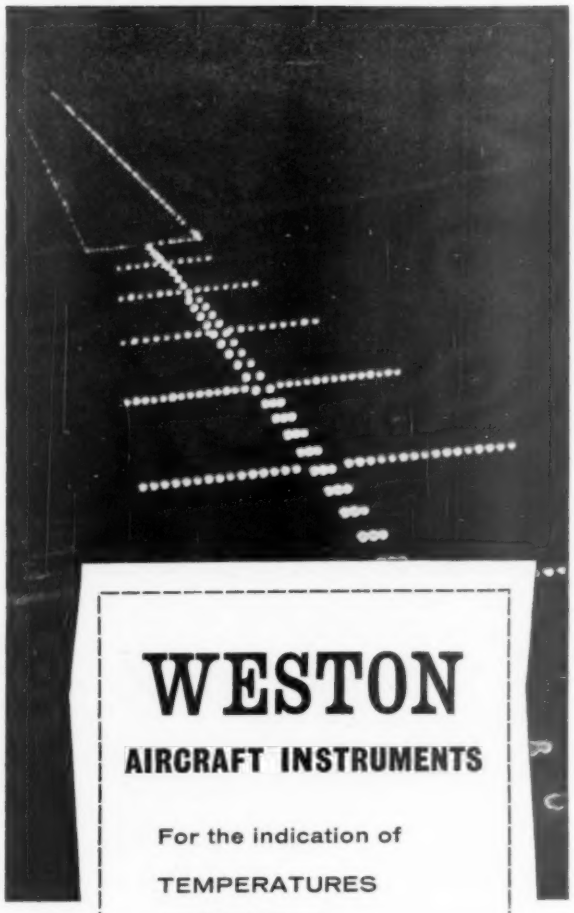

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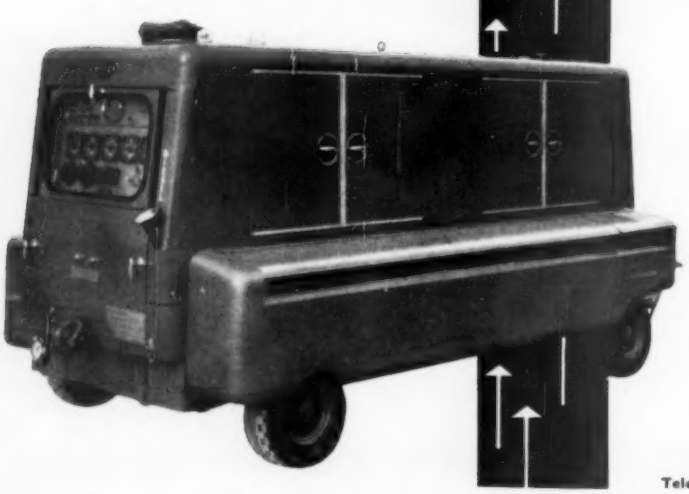

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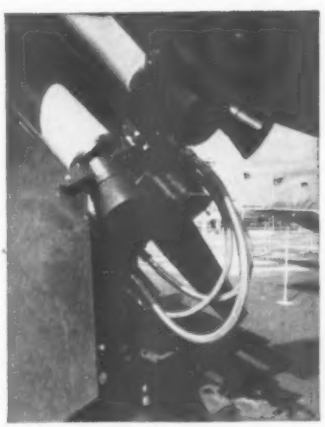

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SPECIFICATION

CLOSED HEIGHT (without top)	11¼"
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HANDLE LENGTH	36"
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WEIGHT FILLED LESS HANDLE	99 lbs.
WEIGHT OF HANDLE	8 lbs.
CAPACITY (in tons of 2,240 lbs.)	30 tons

Sketches show the one-hand manœuvrability of the Millenair Jack. Simply propel across tarmac. Instantly ready for duty.

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The Stream-Line type K filter (illustrated below left) achieves an extremely high efficiency by passing the fuel through specially prepared paper discs compressed by springs and mounted on metal rods; solid impurities are left at the edges of the discs. Any water present causes the paper to swell, with a consequent increase of back pressure which gives an indication that servicing is needed.

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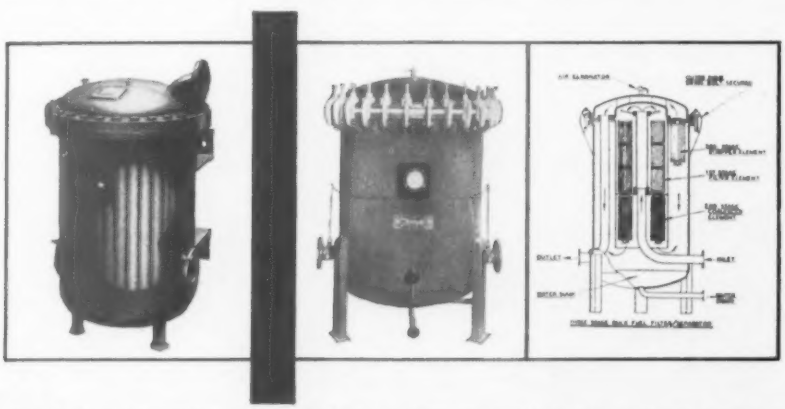
Other Stream-Line equipment (not illustrated) used for the filtration of aviation fuel include a monitor which continuously samples the flow of fuel for the presence of water and the high output MC filter which gives an acceptable filtration efficiency at a much higher flow rate than the K type.



STREAM-LINE

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SF. 110

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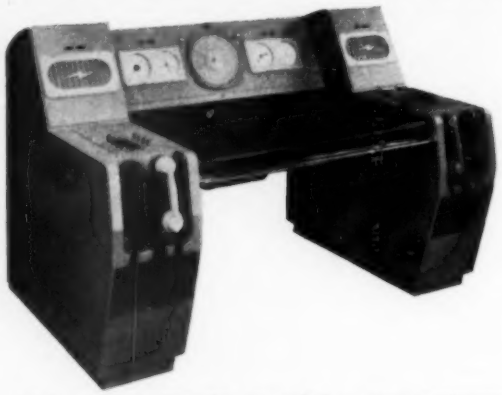
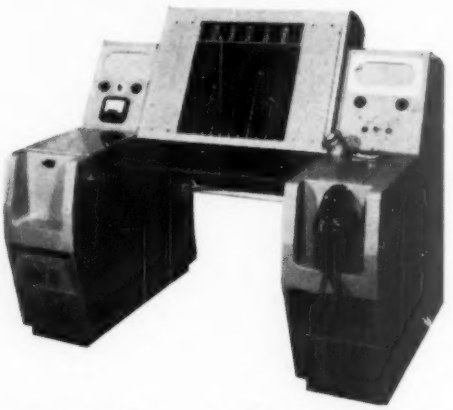


I.A.L. CONTROL CONSOLES



I.A.L. Control Consoles are suited to any requirement demanding a centralized control — for communication centres, airline operations, and air traffic control purposes. They form the nerve centre of any such installation.
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The photographs show I.A.L. Control Consoles (above) for Aerodrome and Approach Control and (right) for a Communication Centre.

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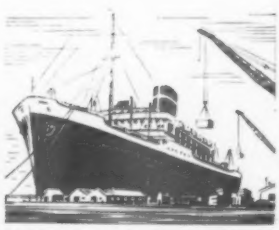

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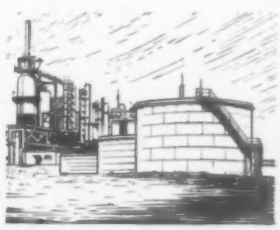

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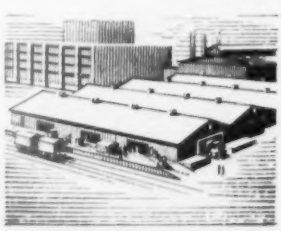

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THE AEROPLANE and ASTRONAUTICS

VOLUME 99 NUMBER 2556 OCTOBER 14, 1960

Coming Dearth of Airfields

News of the week, or at least of the seven days which have elapsed since our last appearance, is unquestionably that of the formation of a new group in the British aircraft industry to build executive aircraft. Unlike all the other group-formations which have been taking place for such a considerable time now, that last week did not seek strength in amalgamating existing units, its strength came from an industrial giant outside aviation, though not without considerable experience of it.

Having made the new "Beagle" group welcome on this page we do not propose to trespass on the feature devoted to it on pp. 518 and 519. What we do wish to do here is to point out that the growth of the export contribution which the new organization may be expected to make must depend largely upon its success in expanding sales of its products in the home market.

Expansion of sales of executive aircraft in the home market must be linked with the expansion of facilities. Facilities, which in these days can mean anything from a wind-tunnel to a rocket-launching installation, is here used to cover the provision of communications equipment at airfields and the provision of airfields themselves.

Let us hope that the genesis of the new Executive and General Aircraft Group will galvanize into action the appropriate authorities in the Ministry of Aviation or if that is too much to hope for at least wake them up to the fact that something has got to be done at once to provide more airfields for airfarers. Twenty aerodromes have been closed since the War. The losses of Hanworth, Hendon, Heston and Croydon still rankle.

What is Mr. Thorneycroft going to do about replacing them? That is the question which everyone with the good of British aviation at heart must ask at every possible opportunity. The Aerodrome Owners Association have been meeting this week. Their views would be of interest.

A satisfactory answer might even get a number of important people off those crowded roads!

Historical Accuracy

Nothing is calculated to keep an editor on his toes more effectively than the knowledge that his readers include a proportion of historical enthusiasts. It is, indeed, the existence of such a group in our readership that makes life in the editorial offices so rewarding.

When a State-controlled organization ventures out to deal with aeronautical history which is to be presented to myriads of viewers it does behove the sponsors to take very special care to see that inaccuracy has been eliminated. As may be seen from letters on our correspondence page, a number of historical bricks seem to have been dropped in a recent television show.

One correspondent recalls the formation by the R.Ae.S. of an Historical Group. But unless it is endowed with powers of censorship over aeronautical films it is difficult to see what even the united knowledge of its members can achieve.

Perhaps it is better to seek relief in the thought that the written word endures and that pictures, particularly TV pictures, fade from memory. Surely the time is ripe for the definitive history of British aeronautical endeavour to be brought into being without further delay.

C

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Matters of Moment

The Drama and the Fact

AEROPLANE accidents—and particularly those involving airliners—are splendid newspaper readership pullers. They have all the essential features—personal tragedy, dramatic suddenness, the extinction of the lives of ordinary people and, best of everything, the feeling for the reader that "it might have been me." It would be idiotic to expect popular papers *not* to take full advantage of the opportunities offered.

But surely the *Daily Express* went far too far on Oct. 6 when reporting and commenting on the Electra crash at Boston. Maybe the picture of two grey-flannel-suited men in a broken seat unit was acceptable; anyhow, it was too good to miss. The suddenness of the catastrophe and the normality of life a few seconds before death were so effectively pin-pointed by the neat white handkerchief in the breast pocket of the victim nearest to the camera. The picture was quite unexceptionable in its vital impact.

But why was the caption so phrased that it might be taken to suggest that, if they had not fastened their safety belts for take-off, they might have survived? The caption merely said: "Two men . . . who fastened their safety belts when the stewardess said so." The implication—however innocently made—was as obvious as it was fatuous.

There was not much justification, either, for the suggestion, in the comment accompanying the news story, that the accident "only adds to the weight of evidence against the turboprop." Only two of the four previous Electra accidents were the result, very indirectly, of the fact that this aircraft is turboprop-powered—and are we expected to forget the hundreds of thousands of hours flown by the Viscounts, the Britannias and the very considerable number of Electras now in service?

The most remarkably good fortune has saved turbojet transports from disaster in at least three incidents during the past two years. If these incidents had become accidents, would the most recent one have added " to the weight of evidence against the turbojet "?

More About the TSR-2

FOLLOWING the recent announcement, by the Minister of Aviation, of a development contract for the "Canberra replacement" TSR-2 (THE AEROPLANE AND ASTRONAUTICS, Sept. 30), the Minister of Defence has described the aircraft as an important contribution to our front-line defence—and as a tactical and strategic weapon capable of carrying a wide range of weapons, including ALBMs. He confirmed that the contract was concerned with a batch of aircraft; the actual number was not stated but it was said to be rather less than was the case with the Lightning [the first order for which was for 20.—ED.].

Mr. Watkinson was paying a visit to the Weybridge works of the British Aircraft Corporation where he saw a mock-up of the TSR-2 and discussed its progress and capabilities with Sir George Edwards and the Vickers-Armstrongs team. And during a Press conference at the end of his trip, a few more pieces of general information about this important new aircraft for the R.A.F. came to light.

The Minister went on record as saying that the TSR-2 was far more than an aircraft; it should be referred to as a weapons system. It would provide the sort of stabilized platform that one would expect in a missile and it carried a mass of electronic equipment "that a year or two ago would not have been possible."

The TSR-2's great interest lies, of course, in the fact that not only can it fly at either subsonic or supersonic speed at a very low height indeed, it can also fly in the region of Mach 2+ at altitude. In its low-altitude rôle, when flying below enemy radar cover, its operational speed is of the order of M=0.9. It is at this speed that its range—the value of which was not disclosed—meets the reconnaissance requirements. It is equipped with a terrain-following automatic control system which makes it possible to fly at these high speeds very close to the ground.

There is still no information available about the geometry of the aircraft—although the Minister commented that for such a big aircraft it had very tiny wings. This suggests a very high wing loading—which ties in with a statement that the aircraft has excellent gust response characteristics so that the pilot is given a comfortable ride at low altitude.

As a joint effort between two design teams, the TSR-2 would appear to be an excellent example of the sort of co-operation than can sometimes result from the merging of organizations. The original design of an aircraft to fulfil the "Canberra-replacement" specification was done by the English Electric company. In this the design was optimized on the low-level aspects of the specification without undue emphasis on the STOL properties that were also needed. The Vickers team on the other hand had concentrated their efforts on the STOL aspects and not on the gust problems in low-level flight.

Although these two approaches would seem to be irreconcilable the co-operative efforts had achieved a wing which preserved the gust response characteristics of the English Electric design and the very short take-off properties of the Vickers design. Sir George Edwards has said, in fact, that he was sure that this would not have been achieved by either team separately.

The Minister of Defence has made it clear that there is a NATO interest in the TSR-2. Its unique properties as a reconnaissance aircraft; the high degree of dispersability conferred by its exceptional STOL properties; and its very-low-level capability, were all characteristics wanted by NATO. Now that metal is being cut and the development contract placed, discussions with NATO would, he said, begin at once.

Likewise there is an American interest in the aircraft and preliminary discussions have been held with the U.S. defence authorities. However, the American operational requirement for an aircraft in this category is not the same as ours and it is by no means certain that they will want an aircraft quite like the TSR-2.

In speaking of its place in the defence picture as a tactical spotter reconnaissance aircraft, Mr. Watkinson said that the TSR-2 represented an answer to the problem of surveying a modern battlefield. The aircraft would, he said, provide an area commander with a television-camera view of the terrain from any height.

Even though "hard facts" about the TSR-2 have still to be released, enough has already been said to indicate that this promises to be a most remarkable aircraft and a most valuable weapon in the R.A.F.'s future armoury. First flight of the prototype is scheduled for the spring of 1963; and the aircraft is expected to go into service as a type in 1965.

EXECUTIVE FOUNDERS.—L. to R.: Mr. J. R. Edwards (managing director, Pressed Steel Company, Ltd.), Mr. Peter Masefield (managing director, Beagle Group), Mr. F. Bates (one of the founders, and deputy chairman, of Auster Aircraft Ltd.), Mr. M. A. H. Bellhouse (deputy chairman, Pressed Steel Ltd.).

See pages 518-519.

MORE THAN EVER.—Soon to resume its flight trials at the R.A.E., Bedford, the Short SB.5 research aircraft has been modified to have 69° of sweepback on its mainplane—claimed to be the most sweepback ever applied to an aeroplane other than a delta. It has previously flown with the wing at 50° and 60°. The Rolls-Royce Derwent engine has been replaced by a Bristol Siddeley Orpheus.

Blackburn's New M.D.

BLACKBURN ENGINES, LTD., announced last week that Air Cdre. F. R. Banks, C.B., O.B.E., C.G.I.A., F.R.Ae.S., M.I.Mech.E., F.Inst.Pet., Hon.F.I.Ae.S., (R.A.F. Retd.) had been appointed managing director. He joined the boards of The Blackburn Group, Ltd., Blackburn Aircraft, Ltd., and Blackburn Engines, Ltd., in August, 1959. Prior to that he had been a director of the Bristol Aeroplane Co., Ltd., and Bristol Siddeley Engines, Ltd.

For many years he was with the Associated Ethyl Co., Ltd., and at the outbreak of hostilities joined the Royal Air Force. In 1940 he was seconded to the Ministry of Aircraft Production and became Director-General of Engine Production and Director of Engine Development.

He returned to Government service in 1953 when he was appointed Principal Director of Engine Research and Development.

Air Cdre. Banks is a well-liked figure in international aviation circles. That regard stems from his frankness in expressing strong views.

He has long been convinced of the need for closer links between our industry and those on the European land mass. Around Farnborough time he expressed the opinion that the remarkable renaissance of the French aviation industry since the end of hostilities should have been seen for the opportunity it provided for forging much closer links. Though advantage had not been taken of the opportunity—when it arose—it was still not too late to effect a getting together.

In spite of this country's reluctance to enter the Common Market the Air Cdre. advocates that large groups in this country should find ways of working together with their opposite members in Europe so that the technical and design teams can learn to co-operate.

New Gapan Liverymen

EIGHT well-known members of the aviation fraternity were invested with the Livery at a Gapan Court on Oct. 8. After the ceremony, the Master, Dr. K. G. Bergin, received freemen and their guests. The new liverymen are:—

Mr. D. L. Brown (formerly Principal of the National School of Gas Turbine Technology, now with Smiths Aviation Division); Capt. Fawdon (formerly with Malayan Airways and shortly joining Ghana Airways); Capt. Grant (B.E.A.); Capt. Greensted (formerly operations director, Hunting-Clan Air Transport, Ltd., now joint director of Curtis Greensted Associates).

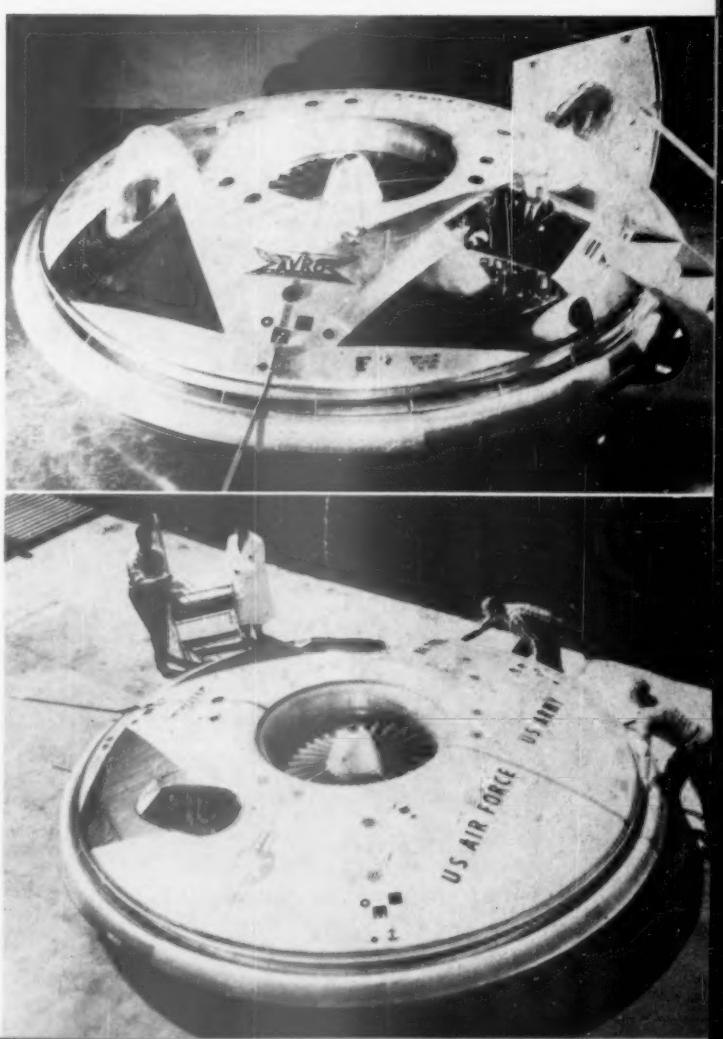
Mr. Harker (Military Aircraft Liaison, Rolls-Royce, Ltd.); Capt. James (director of flight operations, B.E.A.); Capt. B. A. Powell (formerly C.F.I., Hunting-Clan, now airline pilot-instructor with British United Airways); Wg. Cdr. Rendle (formerly chief operations officer and airport commandant, Singapore).

VTOL from Canada

ALTHOUGH the Canadian Avrocar has been under development and test for some time, very little information or photographs have been released. Designated Model 1 by Avro Canada and the VZ-9V by the U.S. military, the Avrocar was designed to explore the potential of a new approach to VTOL. It is strictly a research aircraft and is at present under the sponsorship of the U.S.A.F. and U.S. Army.

The disc-shaped Avrocar uses the air-cushion principle for VTOL but upon reaching a certain translational velocity, it functions as a conventional aircraft supported by aerodynamic forces generated by its forward motion. It has three Continental J-69 turbojets which provide the power for a turbine which in turn operates the centrally located, large-diameter fan. This fan supplies air for the annular jet around the rim to generate the air cushion close to the ground. Unlike other ground cushion vehicles, however, the Avrocar is also capable of high forward speeds at high altitudes.

One of the Avrocars has been tested in the full-scale wind tunnel at Ames Laboratory, Moffett Field, Calif.



VTOL PLUS.—The Canadian Avrocar which is a cushion rider with aircraft capability.

Mr. B. S. Shenstone, chief engineer of B.E.A. since 1948, has been appointed to the board of the Corporation as director.

Worthwhile Inauguration

A NEW scheme of House dinners initiated by the Committee of the Royal Aero Club was evident on Oct. 5, when the chairman of the Aero Club, Col. C. F. H. Gough, gave a lively account of his experiences at the Battle of Arnhem.

He told his audience how they got on to the bridge itself. By a freak of fortune a casually wielded flame-thrower set the bridge paintwork on fire, burnt through the detonator wires and so prevented the Germans from blowing it up.

Those who heard him will long remember the story when, as an escaped prisoner-of-war in South Germany, he shared a concrete air-raid shelter with a German farmer and his family, concealed from their sight by a Yugoslavian prisoner-of-war maid servant.

Listening to Col. Gough one was reminded of the aphorism that strategy is tactics seen through a brass hat. Like all fighting men who see the battle from the midst of it, his estimation of generals is pretty low.

The Aerodrome Owners Forgather

EARLIER this week, members of the Aerodrome Owners' Association met at Folkestone for their annual conference. This was a two-day affair with visits to local transport installations of interest to municipal airfield owners, and lectures on Customs facilities at non-State aerodromes; a lecture on aircraft fire fighting; and the case for helicopter transport in the U.K.

The Aerodrome Owners' Association has a current membership of 113 in three grades—ordinary membership to cover aerodrome owners as such; associate membership for corporations interested in the selection of sites for aerodromes; and affiliated membership for companies and individuals.

Founded in 1934, the Association is a nationally and officially recognized organization, representing the owners of all non-State-controlled aerodromes throughout the British Isles, ranging from the major airports to the smaller licensed grass airfields. Its executive committee comprises 16 members by whom corporation and civil aerodrome owners are equally represented.

This current issue of THE AEROPLANE AND ASTRONAUTICS contains a special supplement covering a number of matters of wide interest to those who operate the larger airports.

Matters of Moment . . . .

B.O.A.C. Flight Appointments

CAPT. DENNIS I. PEACOCK is to take over as B.O.A.C.'s chief of flight operations, in succession to Capt. T. H. Farnsworth. A new post under C.F.O., that of chief pilot, will be filled by Capt. John Woodman, who will be responsible for the maintenance and improvement of operational procedures and standards of airmanship.

An Inadequate Story

TO attempt to tell the story of the great pioneer firm founded by Bob Blackburn in a booklet containing forty pages plus another ten of tables has the effect of damning with faint praise. The "Blackburn Story" completely fails to do justice to its subject.

Its worst shortcomings are its omissions. Believe it or not there is no reference to Bob's brother Norman, a director of the firm, an enthusiastic pilot and everyone's friend. Nor is there a mention of George Lowdell who did so much to put the Lincock on the map. Many more who should be in are left out too.

An extraordinary claim is that Blackburn's built the majority of fuselages for Bristol Britannias now in airline operation. Fuselages were constructed only at Filton and Belfast.

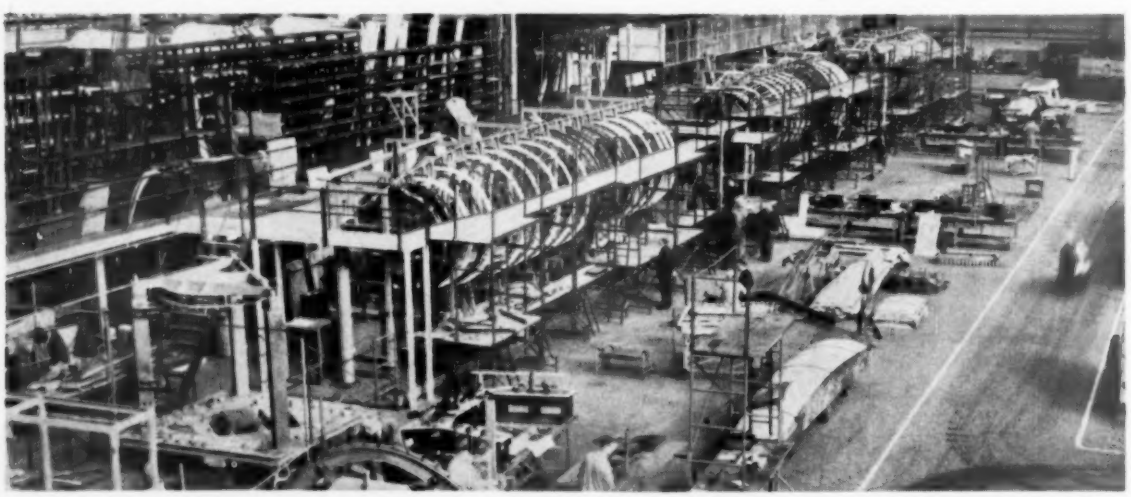
No author's name is given and I don't wonder! He has failed to capture the spirit of the pioneer days and there is but one reference to Reg Kenworthy, best-known Blackburn pilot in the early days. Referring to Kenworthy's mishap in the Pellet at Cowes in the 1923 Schneider Trophy contest the author completely misses the boat. I saw the whole episode.

The aircraft, a small flying-boat, was barely completed in time for the race and its first test flight was part of the preliminary seaworthiness test in the actual contest. In its first attempt to take off it began an uncontrollable "porpoising" and after about the third bounce it went under.

We waited apprehensively and after a minute when Kenworthy failed to reappear we feared he had drowned. However at last he did bob up and was rescued by a motor-launch.

Kenworthy later told me, "When the Pellet sank and I went under with it I was able to breathe air trapped in the nose of the hull. I was not nearly so unconscious as I appeared to be when the first Lord Montagu of Beaulieu rescued me. I merely remained so, as I was being revived by some excellent old brandy and I only recovered when the flask was empty!"

The author should have known about that and other stories which would have added flesh and blood to a dry skeleton. Very little is told of that gallant 1919 airline adventure, the



BOOSTING PRODUCTION.—Part of the Avro 748 production line at the Chadderton factory of A. V. Roe & Co. Ltd. Production order for this aeroplane has been increased by the company from 30 to 60 aircraft.

North Sea Aerial Navigation Co., which was to link the North of England with the Netherlands using twin-engined Blackburn Kangaroos, a venture which was primarily Norman Blackburn's "baby."

It is claimed later that the Cubaroo with the 1,000 h.p. Napier Cub was built because no existing aircraft could take it. In fact the Cub was first installed in an Avro Aldershot and I saw Bert Hinkler make the first test flight at Hamble. The shortcomings of the notorious Botha of 1940, known as the Bother to the R.A.F., are completely glossed over.

Not half enough is made of how Bob Blackburn as a young man in the Leeds firm, Thomas Green and Son, Ltd., was allowed to go "playing with an aeroplane" in 1909, and how as a result of his playing he founded his own firm which 42 years later absorbed Green's.

There is a modicum of good reading material in the booklet. We are told Bob's last official action was telling his A.G.M. on Aug. 25, 1955 he had won a new contract for a naval aircraft (now the Buccaneer). A fortnight later he died.

His memory is surely worthy of a bigger and better book by an author who knew a bit more than the one entrusted with the Blackburn Story. If a thing is worth doing at all it is worth doing well. The Blackburn Story is *not* well told!—G.D.

The Coachmakers' Air Occasion

Lord Brabazon returns to the Attack

SIX distinguished aviation leaders were the official guests of honour at a Court and Livery Dinner of the Worshipful Company of Coachmakers and Coach Harness Makers of London at the Tallow Chandlers' Hall on Oct. 4. Principal among them was Lord Brabazon of Tara, chairman of the Air Registration Board. No less eminent in other spheres of aviation, the other guests were the Chief of the Air Staff, Air Chief Marshal Sir Thomas Pike; Sir George Dowty, president of the Society of British Aircraft Constructors; Dr. Eric Moult, president of the Royal Aeronautical Society; Mr. Basil Smallpeice, managing director of British Overseas Airways Corporation; and Dr. Kenneth Bergin, Master of the Guild of Air Pilots and Air Navigators. Also present as a guest was Sir George Cribbett, until recently deputy chairman of B.O.A.C.

This was, indeed, a most notable aeronautical occasion and, as the Chief of the Air Staff put it, a wonderful dinner in perfect surroundings. It was also very interesting to see in such an historical setting the present president and no fewer than three past-presidents of aviation's own well-founded learned institution, the World's oldest aeronautical society.

Perhaps the most remarkable event of the evening was, however, an offer by Lord Brabazon—before so distinguished a company—to stand in a pool of paraffin at London Airport and to strike a match in the cause of using kerosene in gas-turbine engines to the exclusion of gasolene.

In his toast to the Worshipful Company LORD BRABAZON had returned to a topic upon which he has forcibly expressed himself before. All through the history of flight, he said, we had been saddled with carrying the most dangerous of fuels—petrol. The advent of the jet engine had made this unnecessary; but he was most disturbed to find that at a recent IATA conference it had been suggested by an airline executive that if wide-cut gasolene became cheaper it would be more widely used in commercial aero gas-turbines.

Here he made his point by offering to indulge in what can only be called a fuel duel. He would go to London Airport with 40 gallons of kerosene, spill it on the tarmac stand in the centre of the pool and light a match—provided that Mr. Gordon McGregor of T.C.A. (which uses JP.4 in its Viscounts) would do likewise with 40 gallons of JP.4.

Lord Brabazon had preceded his challenge with some complimentary remarks concerning the Worshipful Company which, he said, had seen two major developments in transport—the use of the motor car and the birth of flight. It was, he thought, a splendid thing that both the industries concerned had "rallied round" the Coachmakers. They had made it a remarkable thing pulsating with life and closely associated with the developments of the new technological age.

Speaking of the development of the aeroplane, Lord Brabazon remarked on the speed of its technical advance—even to the extent of having seen the introduction of a new prime mover. In the march from the early Wrights to the Boeing 707s the aeroplane that impressed him most was the Douglas DC-2. It was, he said, the father of all the commercial aircraft in use today; it had a stressed skin, flaps, retractable undercarriage and variable-pitch propellers. But everyone of these refinements, he added, were banned, by the Air Ministry of the time, from being incorporated in military aeroplanes—which showed the advantage, or disadvantage, of State control.

He also had something to say about the reliability of aero engines. Recalling the early Farmans and the use of steam cooling and fuel injection, he suggested that it was not until the advent of the Gnôme engine that any reliability was really enjoyed.

Lord Brabazon concluded his Toast by saying that the Worshipful Company was an example of the genius of our race combining as it did an old Company with a new development.

Replying on behalf of the Company, SIR REGINALD VERDON SMITH referred to the guest of honour who had proposed the Toast as one of our most polished, urbane, captivating, devastating and witty after-dinner speakers. Lord Brabazon had, he said, in his address that evening, added lustre to his reputation in these respects.

Without exactly naming names, however, he took issue with him regarding the place of the DC-2 in aeronautical development history. There was, for example, a project that had been encouraged by Lord Rothermere.

He thought that the Company had been privileged to be the platform from which the chairman of the Air Registration Board could make a vital point. As a frequent airline passenger he heartily agreed with him on the subject of fuels. He thanked him, too, for the encouraging things he had said about the Livery.

Only five weeks had passed since the Court of the Company had seen fit to entrust the new officers with their responsibilities. He made reference to the Junior Warden, Lt.-Col. R. T. Harris; the Renter Warden, Mr. P. S. Croall; and the Senior Warden, Col. G. A. Morris. And he acknowledged his own appreciation of the honour done to him by his election as Master.

Here, Sir Reginald said how glad everyone was to see Sir Frederick Handley Page—a past-Master of the Company—present at the dinner. He spoke of "H.P.'s" silver-tongued persuasion and paid a warm tribute to the part he had played in the affairs of the Company. Sir Frederick, he said, more than anyone else, had a great sense of historical continuity. It was he who first encouraged the Company's Court to recognize aviation in its affairs.

The Master noted two absentees who had been unable to be present by reason of prior commitments. One was Lord Douglas of Kirtleside, the other Sir Matthew Slattery, newly appointed chairman of B.O.A.C.

Sir Reginald rounded off his speech with a reference to an article in *The Observer* in which mention was made of people being asphyxiated by a conflict between their imaginations and professions. In aviation, he said, no one could suffer from any such conflict; aeronautics was a profession which thrived on flights of imagination.

After GP. CAPT. F. C. V. LAWS, a past-Master of the Company had most ably proposed the health of the distinguished guests, AIR CHIEF MARSHAL SIR THOMAS PIKE, Chief of the Air Staff, replied. He gave thanks for the honour done to the Royal Air Force by the invitation to him to be a guest and for the opportunity to reply for all the others. He was tempted to comment on two points made by Lord Brabazon—having learned to fly on a Gnôme-powered aircraft he was not so convinced of that engine's reliability; and he felt that his comment about the Air Ministry regarding developments was inaccurate.

In a more serious vein, the C.A.S. said that the Royal Air Force was charged with the duty of maintaining the deterrent force. This was one of the big moral issues of our day; there were many people who showed open hostility to the atom bomb. Free speech, he affirmed was a priceless thing, but most people who made remarks against the nuclear deterrent had no responsibilities in that direction. Those who had such responsibilities took a different view.

We cannot, said Sir Thomas, throw away our heritage; it is our duty to take part in World affairs. It was no good reducing oneself to a position of weakness. If we wanted to have notice taken of us in World affairs we must be strong. The responsibility of our national leaders was enormous. The penalty for error was very great; but the prize was lasting peace.—F.T.M.

Putting Executive Aircraft on the Map

A SHOT in the arm that is certain to have a marked effect upon British aviation was given last week by the announcement from the £25 million Pressed Steel Company of Oxford, Swansea, Swindon and Glasgow, that it had formed a subsidiary to acquire the long-established Auster Company, Britain's only quantity producer of light aeroplanes and, at the same time had arranged a manufacturing and technical liaison with F. G. Miles, Ltd., of Shoreham.

With the announcement came the realization that at long, long last men of vision and ability had come together with vast resources behind them to fill the vacuum so clearly apparent in the capabilities of the British aircraft industry. Equally inspiring to those working in the manufacturing side of the industry was the fact that there was going to be an opportunity for those who believed in the future of general aviation as opposed to rocketry, supersonics and the complex techniques of modern military and civil high-speed aviation. Most importantly, it was clear to all that in due course the products of the new enterprise selling over the World could be expected to play an important part in filling the gaps certain to appear in our aviation export figures as the restrictive effect of the Government's negative military policy began to make itself apparent.

EXECUTIVE CENTRE.—Kidlington airfield, headquarters of the Pressed Steel Company's aircraft fleet. The occasion was Shackleton's Sales Weekend.

Owing to the complicated ritual of City transactions, we have had to wait a week for an opportunity to comment. Pressed Steel, of course, are no new phenomenon in the British industrial scene, nor for that matter in the aeronautical one. Formation of Beagle is the third major P.S.C. announcement this year.

Interest is naturally concentrated on the "new range of executive and light aircraft for the home and export markets." However, it has been made quite definite that Beagle do not intend to make any pronouncement until the hardware exists. How long this will be is anybody's guess, but it will be surprising if further news is not forthcoming by next year's S.B.A.C. Show.

Meantime, as the official statement makes clear, production and further development of the existing range of Auster light aircraft are to be pushed ahead. Moreover, Auster is a long-standing member of the S.B.A.C. As such, it has long been a recipient of Ministry orders.

There is, at this stage, a wide gap to be filled between the types offered by Austers, who have yet to market a high-wing with a tricycle undercarriage, and the variety of types offered by the Americans. Moreover, Austers have always stuck to the classic welded steel tube fuselage and fabric covering. And one must assume that, however much opportunity is taken of Pressed Steel's automobile experience, this policy is not likely to be seriously altered. On the other hand, it will be strange if experience of automobile styling does not help give the highly regarded products from Rearsby a new look.

It is significant that the chairman of Beagle, Mr. M. A. H. Bellhouse, is no newcomer to aviation. He spent the War with the Royal Air Force, retiring as a wing commander. He is a private pilot of some experience to which experience he assiduously adds more weekly. Pressed Steel, of which he is deputy chairman, it will be recalled, acquired Kidlington aerodrome earlier this year.

Not only does the company keep its fleet of executive aircraft there, but the airfield is headquarters for the P.S.C. pool of six pilots. Pressed Steel operate executive aircraft for other companies in the motor business besides running the Oxford Aero Club. The company has experience of small aircraft such as the Piper Tripacer and much larger executive craft, of which their D.H. Dove is a prominent example.

It should be recalled that Pressed Steel began to play an important part in the Air Ministry's expansion programme by 1937, only 11 years after its foundation. For the next eight years of its life it devoted increasing resources to the airframe programme.

By 1945 it had built among thousands of other aircraft components, 4,600 sets of wing nosing for Spitfires, and 10,000 sets of cowling panels and sub-assemblies for the Hurricane. After the War during the period October, 1951 to 1957, P.S.C. tooled and produced well over 1,000 Hawker Hunter rear fuselage complete units in their factory at Linwood. In addition for that aircraft P.S.C. tooled up the armament packs.

It is thus clear that it has a vast experience in the manipulation and forming of light alloy material and the production of complex components. It is exactly in the application of light alloy techniques to small aircraft that this country has been so retrograde.

In this connection it is worth recalling that the use of Rolls-Royce-built American horizontally opposed air-cooled engines under licence has been mentioned in connection with the Short Skyvan project. It would seem likely the first interest of Beagle will be in engines of similar power. At Rolls-Royce as deputy chairman is Mr. Whitney Straight, long-time private owner and, in consequence, well disposed to expedite the new engine programme.

It is worth remembering that among the successful European types

SATURDAY START.—Mr. Peter Masefield, managing director of Beagle, takes the chair at the first design meeting (Oct. 8). On his right, Mr. George Miles; on his left, Messrs. Angell, Bird and Niedermayer.

Photographs copyright "The Aeroplane and Astronautics"

imported here there has been at least one high-wing type. As Pressed Steel do not have an aircraft drawing office, the arrangement for a technical and manufacturing liaison with F. G. Miles, Ltd., is seen to have a special significance. This concern has built an all-metal turbine-engined trainer if not of high wing, at least of shoulder-wing layout.

For prototype work there is certainly much design and manufacturing experience available at Shoreham. It is worth noting that F. G. Miles, Ltd., have always been interested in the use of plastics materials and particularly in their application to aircraft construction, at least in the secondary role. It will be seen then that there are resources immediately available for the production of a prototype.

Mr. Peter Masefield, the managing director of Beagle, is a practising aviator whose driving enthusiasm must have played no small part in organizing the components of the whole plan. He has been a practising aviator since he used to fly about the Government's affairs in his own Hurricane. His souped-up and streamlined Chipmunk has become admired and familiar on many airfields.

He is known to have been responsible for the inauguration of extensive studies into the light aeroplane market, while managing director of Bristol Aircraft, Ltd. As chairman of Auster he will presumably be in a position to represent the company in the councils of the S.B.A.C.

With men of such experience on the board of the new company it is certain that minimum unserviceability and maximum all-weather capability will be two overriding requirements. It is a curious paradox that though precise limits are essential for the mass production requirements of motorcar manufacture, they are not utilized as much as one might expect for maintenance purposes. When one crashes a motorcar wing it is generally the local tin-basher who does the repair. The coming of the mass-produced aeroplane will change the paradox, for interchangeable cowling, flying control surfaces, wingtips, trailing edges and the like are a must if low maintenance costs are to be guaranteed.

Maximum all-weather capability is largely determined by the class of radio and navigation aids incorporated. So far the poor serviceability of imported radio equipment due to lack of spares when needed has been a major problem and caused much expense for private and executive owners. It can be taken as certain that in this field the resources behind Beagle will be at their most effective.

But however effective they are it will be necessary to bring some changes in the official outlook in this country. At present private operators are required to have the whole range of frequencies that are available to the civil transport operators. Rigorous simplification is required here and it is good news that the Royal Aero Club which stands to gain so much by the appearance of the new company, is playing its part in this field. However, there is a field in which not only the Royal Aero Club but the whole aviation fraternity needs to get cracking. And this is the provision of airfields and customs facilities.

CONTINUING PRODUCTION.—Rearsby, headquarters of Auster Aircraft, where production is to continue and develop.

Finding that even the operation of a successful aerodrome involves the State in a severe loss, the Ministry of Aviation is more concerned to divest itself of responsibility than to prosecute vigorously any plan for the creation of more airfields. Yet it is a lack of airfields which is to some extent responsible for the poor health of what may be defined as general aviation in these islands. There is today, as a result of this policy, an appalling famine of airfields round London. Hanworth, Heston, Hendon all gone. Gone, too, is Croydon. Soon to follow them is Southampton's Eastleigh. In all 20 such have been closed since the War.

In such circumstances it is surprising that the demand for executive aircraft has proved so vigorous. No doubt it is partially to be explained by the growing policy of taking the work to the worker. It is extraordinary how far afield it has proved economically satisfactory to go in pursuit of this policy. The solution of having a factory in Northern Ireland is now no new thing and executives long ago found it satisfactory to have an aircraft for such travel. So do businesses with departments in Scotland.

Sir George Dowty, president of the S.B.A.C., who has been clocking up a remarkable number of hours in his recently acquired Dove, is not only using it for trips to the factories of his organization in Ireland and the Isle of Man, but also to Malta where his latest acquisitions lie.

Such overseas trips not only emphasize the advantages of executive transport, they provide evidence for the need of customs facilities at more than the metropolitan airfields.

Thus we look forward in the long run to a healthy series of happenings arising out of last week's announcement. First and most valuable there will be a substantial addition in the range of types available for export, thus reinforcing the hard-pressed military manufacturers. Success in the home market and in those overseas will ensure a growth in employment at all levels in the aircraft industry. And at home an increase in the number of owners will promote a rise in the facilities on offer to them.

The Official Announcement

A New Group for British General Aviation

PRESSED STEEL CO., LTD. is taking steps to form a subsidiary company to be known as "British Executive and General Aviation, Ltd." (BEAGLE) which will concentrate upon the design and manufacture of a new range of executive and light aircraft for the home and export markets.

To this end, Pressed Steel is acquiring the whole of the share capital of **Auster Aircraft, Ltd.**, for a consideration of £525,000, to be satisfied, in part, by the issue to the Auster shareholders of 264,000 Pressed Steel 5s. ordinary shares, the balance being in cash.

The intention is to continue the production and further development of the existing Auster range of light aircraft.

At the same time, a technical and manufacturing liaison has been arranged with **F. G. Miles, Ltd.**, of Shoreham Airport.

This new group of companies is also entering into discussions with Rolls-Royce, Ltd., in connection with a series of Rolls-Royce powerplants for this class of aircraft.

MR. M. A. H. BELLHOUSE, deputy chairman of Pressed Steel will be chairman of Beagle. MR. J. R. EDWARDS, managing director of Pressed Steel, will be a member of the Beagle board.

MR. PETER G. MASEFIELD, who has joined the board of Pressed Steel, will become managing director of Beagle, and chairman of Auster.

MR. F. BATES and other executive directors will remain on the board of Auster; Mr. Bates becoming deputy chairman, and, at the same time, retaining his position as managing director.

MR. GEORGE H. MILES will be appointed technical director on a co-ordinating board, which is to be formed under the chairmanship of Mr. Masefield.

Pressed Steel, whose headquarters is at Cowley, Oxford, is already prominent in the manufacture of motorcar bodies and railway rolling stock, as well as refrigeration through its Prestcold Division. It owns and operates from Oxford Airport executive aircraft which are in constant use between the company's works at Oxford, Swansea, Swindon, Glasgow and Reading.

The new aviation development is a logical extension of the company's interests in other fields of transport, and will enable it to bring its knowledge of production methods generally, into the manufacture of light aircraft.

Mr. Peter Masefield's experience in aircraft manufacture and in air transport, together with that of Auster and Miles in the production of light aircraft, concentrates in the Beagle Group an unrivalled background for the development of the new British aircraft for executive and general aviation which have been so lacking since the War.

Air Transport

MATS Interim Freighters

A DECISION is expected to be made by the U.S.A.F. on Oct. 15 in the interim re-equipment programme for Military Air Transport Service. Given impetus by the release of additional funds voted by Congress for the Fiscal 1961 budget, this programme now covers two types of aircraft for interim modernization to be followed in about four years' time by a completely new aircraft to be developed to the U.S.A.F.'s Specific Operational Requirement 182. The decisions reached in this connection will influence largely the development of civil freighters in the U.S.

An order for about 40 Lockheed C-130E Hercules, valued at $83 million, has already been placed as the first part of the interim re-equipment, and it is the second type which is to be selected on Oct. 15. A total of $117 million has been earmarked for this part of the programme. The choice is understood to lie between versions of the Boeing KC-135 and 707, Convair 600 and Douglas DC-8, with the further possibility that Canadair CL-44s might be purchased.

MATS personnel are known to think highly of the swing-tail CL-44D, but there are obvious difficulties associated with the purchase of non-American equipment for the U.S. armed forces. One solution suggested to this problem is that in return for a $150 million order for 50 CL-44s, Canada should buy, for an equal sum, radar sites and electronic installations built by the U.S. in the Canadian Arctic. Another reported possibility is the purchase for the R.C.A.F. of 70 McDonnell F-101 Voodoo fighters; but the political implications of such a move, following the cancellation by the present Canadian government of the Avro Arrow programme, makes this improbable.

Boeing has offered, for MATS interim use, a version of the KC-135 with the tanker equipment deleted and with side loading or a swing-tail version of the 707-320; both are available with turbojet or turbofan engines. The Douglas and Convair proposals are based on swing-tail versions of their respective commercial transport designs.

The S.O.R.182 type, of which MATS wants 376 eventually, will be turbofan-powered and will have to carry a 50,000-lb. payload over 4,000 naut. miles. The results of an F.A.A. survey of civil cargo operators' requirements have been noted by the U.S.A.F. in writing this specification.

Boeing 727—A Decision Soon?

BOEING'S management may be faced with a momentous decision at its regular December meeting, when it will probably have to decide the future of the 727 short-haul project. After several years of intensive design studies on different configurations, Boeing has recently "frozen" this project as a rear-mounted three-engined design and is now attempting to break the vicious circle in which the manufacturer waits for firm airline orders, while the airlines wait for the manufacturer to go ahead.

United Air Lines' president, W. A. Patterson, has gone on record as saying that his airline could use 40 Boeing 727s, and U.A.L. has, in fact, been Boeing's principal target in the design of this aircraft. Eastern Air Lines also is a prospective early customer, but Boeing would like to see orders for "about 100" 727s before cutting metal.

Under the competitive threat of the Douglas-engineered Caravelle 14—which Boeing regards as its biggest competitor for the U.S. domestic short-haul market—Boeing will need to make a decision soon, regardless of airline orders, whether or not to proceed with the 727. If the target in-service date of Jan. 1, 1964, is to be met, this decision can scarcely be delayed beyond the end of this year. Boeing's senior vice-president, Mr. Wellwood E. Beall, said in London last week that he thought the chances of the 727 going ahead were "better than 50-50."

Although Boeing apparently does not regard the D.H.121 Trident as a serious contender for the U.S. market, there is little doubt that the 727, if built, will adversely affect Trident sales in other parts of the World. In the two years of 707 operations, the Boeing company has built up a first-class reputation, which is backed by a growing wealth of experience in design and production, unmatched by any other manufacturer in the jet transport field. Boeing has so far announced the sale of 245 707s and 720s in eight significantly different versions. If the 727 is added to this range as a genuine second-generation jet (which the Trident is also), the company will be in a formidably strong position.

As now planned, the Boeing 727 is similar in size and layout to the Trident, the one major difference being the use of drag-reducing wing nacelles to contain the wide-track undercarriage. To meet the requirements of the U.S. domestic operators, however, the field performance has been improved to 5,000 ft. for full weight take-offs, compared with the Trident's 5,800 ft. At 128,000 lb., the 727 is 23,000 lb. heavier than the Trident, or about the same as the Trident 2, projected for the U.S. market but probably not available for service before the end of 1964. Boeing favoured the Allison-built Rolls-Royce RB163s (designated ARB.963) for the 727 on grounds of weight and cost, but present indications are that the U.S. airlines will want to use Pratt & Whitney JT8D-1 turbofans based on the U.S. Navy J52 engine.

T.W.A. and Howard Hughes

FOR some time Trans World Airlines has been troubled with financing difficulties which have delayed the delivery of its Convair 880s (see our issue of Sept. 30, pp. 468-469), on which a down-payment but no completion payments have been made, and have held up the plans for a merger with Northeast Airlines.

T.W.A. has been controlled by Howard Hughes through his ownership of the Hughes Tool Company, which had a 78% holding in the airline. Hughes Tool owns T.W.A.'s present Boeing fleet, which is leased by the airline, and has ordered its 880s—20 for T.W.A. and six for Northeast.

On Friday of last week it was reported from New York that Mr. Hughes has agreed to relinquish control as a condition on which a group of banks and other lenders have agreed to an urgent $318 million financing arrangement. The Hughes Tool holding will be put in trusteeship. The trustees will decide on the next president of T.W.A. and Mr. F. M. Glass (see our last week's issue, p. 509), of the Empire State Building Company, has already been named as a suitable choice.

Experience with Kerosene

FIGURES given by Mr. M. G. Beard, of American Airlines, in a recent paper before the American Chemical Society, indicate the greater safety of kerosene in airline operation compared with high-octane petrol. Unfortunately, however, statistics were not included to show the relative safety of kerosene and JP-4.

In the 19-month period from Jan. 1, 1959, to Jly. 31, 1960, according to Mr. Beard, there had been 86 accidents involving airliners on revenue or non-revenue flying. Of these, 53 were to aircraft using petrol and 33 to those using kerosene; 43.5% of the accidents in the former group resulted in fire, but only 21% of the latter. Of the accidents involving fatalities, there was fire in 81% of those aircraft using petrol, and 60% of those using kerosene.

CONVAIRIETY.—First flown on Oct. 3, the Convair 880-M (modified from an 880) has several changes to improve take-off performance and to offer greater range. The wing now has four leading-edge slats, and the rudder has power boost. The u/c has been strengthened, a proportional anti-skid braking system is fitted and a tail skid has been added. Provision is made for an extra 1,540 Imp. gal. of fuel.

Nothing beats these drums

Up the river Tocantins in drums — that's the way aviation fuel is delivered to Carolina airport deep in the interior of Brazil. But the Tocantins is a treacherous river riddled with dangerous rapids. Progress is slow and time after time the big drums must be unloaded to make the river boats light enough to winch by hand through the swirling waters.

On the first leg of the 750-mile trip, from Belem to Maraba, no fewer than five of these transhipments may have to be made. And each time the drums must be heaved up the bank and often hand-rolled round the rapids. At one spot, however, a little wood-burning railway does the job. At another, a truck — the only one for miles — helps out. But at a third spot the drums must be dragged through the water. The undergrowth is too dense to go overland.

At Maraba, the drums are transferred to smaller, more agile craft. But the endless unloading-hauling-loading sequence continues. Once, twice, three times — perhaps more. It all depends on the state of the river. Sometimes a round trip can take up to seven months to complete. But the supplies get through and an important fuelling stage on the Brazilian network is kept open. The tireless crews make sure of that. And so does Shell.

No matter where an airport is situated, Shell will always find a way to supply it.

SHELL

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One good service deserves another

BEA carry 26% of Europe's scheduled air traffic—nearly 2 million international passengers in a year; and they do so on a sound economic basis, proved by a substantial profit record. AIR BP assists BEA to run profitable services by reducing costly time on the ground. Fast, accurate AIR BP fuelling, using the newest methods, cuts costs on Comets to Athens and at most of the other 82 destinations within the BEA network.

Fast flying **BEA** ***...fast fuelling*** **AIR BP**

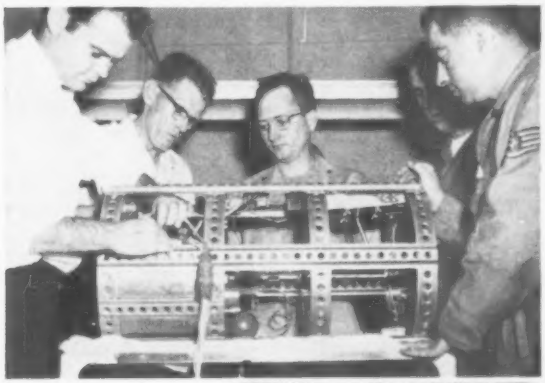
Brooks A.F.B., Texas, Oct. 2

Aerospace Research at San Antonio

"PEOPLE are the end guinea pigs: animals take away the danger to humans." This statement reflects the basic approach of the U.S.A.F. School of Aviation Medicine in the research programmes with animals which are leading up to manned flight in space.

The U.S.A.F. Aerospace Medical Center, which has its headquarters in Texas at Brooks A.F.B., near San Antonio, was formed in October last year when four of the leading U.S.A.F. medical, educational and research establishments were united under one command. They were the School of Aviation Medicine; the U.S.A.F. Hospital at Lackland, the Epidemiological Laboratory and the Medical Service School.

During a recent visit to Brooks I saw some of the research facilities and work done by the School of Aviation Medicine.



SIMIAN ASTRONAUT.—Above, preparing the specially developed container and (right) a rhesus monkey in the couch (or chair?) which in turn is attached inside the bio-pak.

As well as research, the School also gives aviation-medicine training to doctors, nurses and medical technicians. It provides a consultative service for flying personnel on physical problems which affect their flying status. Much of the School's work has to do with research into aspects of manned spaceflight, such as radiation hazards, pressure suits, space-cabin simulators, weightlessness and planetary environments.

Radiation

A high-level cobalt 60 radiation source is used for many experiments. The School also has a "half-mouse thickness" neutron generator, a 100,000-V. generator producing a neutron stream which will pass half-way through a mouse. Radiation studies form a vital but difficult field. Humans are increasingly likely to be subjected to radiation from nuclear-power sources and possibly from weapons. Yet so far there are relatively few cases of human exposure which can be used in assessing clinical changes, following exposure to different levels of radiation.

Much use must inevitably be made of animals for these studies. Unfortunately, there is no indicator of radiation absorption. With a dosimeter it is possible to measure exposure to radiation, but the degree of absorption cannot be assessed.

Some of the physical changes caused by radiation occur within 1/10,000 of a second. At present it is virtually impossible to study the exact mechanism of these changes. The problem may be compared with studying a body injury weeks after it has happened when a whole series of later changes have occurred.

Genetic effects of the cosmic radiation likely to be met in spaceflight are being studied using bread mould and nerve cells in tissue culture; these are sent up on high-altitude balloon and rocket flights. Experiments made so far indicate that the normal background intensity of cosmic rays near the Earth is low enough to make 24-hr. manned flights safe.

Space-cabin Simulators

Work on sealed cabins which simulate the internal living conditions in space vehicles goes back to 1952 when Dr. Hubertus Strughold, the School's adviser for research, suggested that an experimental cabin should be built. The first of these, a one-man cabin, was delivered in 1954.

A man made a simulated "Moon-trip" in this space cabin in 1958, spending a week inside it so that scientists could study his reaction to prolonged isolation and to conditions inside the cabin. The internal air pressure was equivalent to an altitude of 18,000 ft., or half sea-level pressure. A constant flow of oxygen was provided to the cabin and carbon dioxide was absorbed by chemicals.

Much more ambitious tests are now being made with a space-cabin simulator in which two U.S.A.F. officers spent 30 days before emerging from it on Sept. 15. This cabin, 84 ft. high and 12 ft. long, has been designed to test life-support systems for spaceflight as well as to study the reactions of men to the cramped and isolated life they will endure in a space capsule.

Built by Minneapolis-Honeywell, the cabin will give information for the design of living and working quarters in future space vehicles. It has systems which reduce all organic waste to a small amount of ash and recycle urine and waste water into drinkable water.

During this latest test every effort was made to ensure that the conditions in the capsule would be as realistic as possible. An inspection of the capsule gave one indication of how the men had reacted; a small notice inside said: "Thought for the day—never volunteer."

During their 30-day endurance test the two men were given virtually no information about the outside world and they were allowed to take only four books with them. They had a tight work schedule to keep up inside the capsule; its simulated flight-control panel was manned 22 hours daily.

While one man was on duty at the panel the other had to calibrate instruments, purify waste liquids to replenish the cabin water supply, eat, sleep and take a turn at housekeeping. The flight-control panel was designed so that scientists could determine how isolation, confinement, and work and rest schedules affected the responses and reaction times of the men in the capsule.

Internal pressure of the capsule was atmospheric, because it is considered that this will be a realistic pressure to maintain inside future space capsules which travel great distances. Temperature was maintained between 22 and 24° C. and the humidity at around 30%.

Communication with the outside world was limited, but every 90 minutes the men gave short reports on conditions inside the cabin; they reported on temperature, humidity, carbon dioxide level, water-vapour percentage and cabin pressure. They reported

HUMAN GUINEA PIGS.—Capt. W. D. Habluetzel (left) and 1st Lieut. J. J. Hargreaves (right), both U.S.A.F. pilots, signal their readiness to begin their 30-day ordeal in the space cabin simulator on Aug. 15 last.

their blood pressure and temperature daily. Each man spent two hours a day taking a test which recorded his heart activity and respiration rate on recorders outside the cabin. Twice a week both men took blood samples and passed these out, through an airlock in the cabin, for analysis.

Throughout the 30 days the occupants carefully noted and reported their consumption of food and water. They began the test with 80 lb. of pre-cooked dehydrated food and 22 gallons of fresh water, which latter quantity was maintained by recycling and purifying the subject's body water within the cabin. Waste material was disposed of by incineration and jettisoning.

Not all the food was eaten during the test, which could have been extended to 45 days. All the initial store of water was consumed in just under 20 days. Water was recovered by purification, but some trouble was experienced towards the end of the test with bacteriological contamination of stored water, which went cloudy.

During the simulated spaceflights the subjects both lost weight, one losing 8 lb. and the other 5 lb. On the whole the reactions of the subjects to their simulated control tasks remained good, but the reaction time of one person to a particular task deteriorated by several seconds.

According to the officer who was in charge of the test, the greatest problem which faced the subjects after about the third day was "the realization of what they had committed themselves to."

Weightlessness

High-performance fighters have been used for several years by the Department of Space Medicine to study conditions of weightless flight. Early tests suggested that muscular co-ordination was impaired in weightless flight and that subjects felt disorientated. These reactions are severe initially, but are usually overcome with experience.

A programme has now been started to obtain a great deal of physiological data under weightless conditions with F.100Fs flying a parabolic course; this permits weightlessness to be simulated for up to one minute. The effects of weightlessness on animals has also been tested in rocket launchings of mice and monkeys.

Training of the Mercury astronauts in weightless flight began last December. It was designed to give them experience in this field and also to develop and test some of the hardware such as special food containers which will be used during orbital flight.

Another approach to the simulation of weightlessness is to float in water, as was done for a week by a doctor from the school. Results of this test, which was made last February, suggest that unless astronauts exercise regularly or are provided with artificial gravity when in space, they may be more vulnerable to the high *g* forces during re-entry.

Bio-Pak Development

Sealed biological packages have been developed for maintaining small animals alive in extreme conditions of weightlessness, acceleration, vibration and spinning. In conjunction with this a range of reliable miniature instruments has been developed to record biological data from animals during space flight.

Data has been collected on the oxygen consumption, carbon dioxide output, food requirements, water metabolism and nitrogen balance on a variety of animals including the mouse, squirrel and rhesus monkey, the chimpanzee and man himself.

In developing bio-paks and their instrumentation the emphasis has been on reducing size and weight to a minimum. In fact, one of the young rhesus monkeys originally selected to travel in a Discoverer satellite will not do so now because it has grown too large to fit into the bio-pak designed for the job.

These bio-paks have automatic oxygen and temperature-control systems and carbon dioxide, water vapour and waste absorbers. They have been produced for both mice and monkeys.

During our visit to the School of Aviation Medicine we saw two of the monkeys which had been aloft in capsules of this kind. Sam had been up to 55 miles and Miss Sam to 9¼ miles. Both appeared very healthy; they are now retired from space service and, when mature, will be mated to see if their offspring suffer in any way from having had such a high-flying father.

The bio-pak in which each of these rhesus monkeys was launched weighed just over 100 lb. It is 36 in. long and 16 in. in diameter, and can maintain its occupant alive for 40 hours, the limiting factor being the oxygen supply. A small fan is used to circulate air within the capsule and the temperature is kept at a comfortable level by controlling the absorption of body heat by a heat sink. Excess water vapour and carbon dioxide is taken up by absorbent units.

For these launchings, Sam and Miss Sam were trained to move a lever when a cue light went on, so that their performance in both high-*g* and weightless conditions could be assessed. During the flights the monkeys responded to the cue light as they had been trained to do.

This bio-pak work has given useful information for the Mercury programme. The first orbit of a Discoverer satellite with a monkey aboard, scheduled for this month, will be an important step forward in this programme.

Questions of Space Biology

ASTRONAUTS selected for "Project Mercury" have daring in them but are not daredevil types; they "expect to be in business many years", and in fact look like business executives, according to Lt.-Col. W. R. Turner, of the Aerospace Medical Division of Wright Patterson Air Force Base, Ohio, who spoke at a two-day symposium on "The Biology of Space Travel" held by the Institute of Biology at the end of September. But tests of their reactions to the expected stresses of space flight cannot be applied in the sequence, or with the same severity, as the stresses which they will actually encounter. "In-flight data" are really needed to solve "the problems of astronaut selection."

From Dr. W. Grey Walter, psychologist and author of a popular book "The Living Brain," ideas came tumbling out in the discussions, in conversation at lunch, and in his paper with the mystery title: "The human brain in space time". He was doubtful about the criteria used by Col. Turner in selecting astronauts. They were not only too "normal," he thought, but their high level of training would incline them to deal with an unexpected situation by trying to fit it into the framework of what they had already learnt, in the hope of being able to deal with it in a way they had been trained to regard as appropriate.

The space traveller, on the other hand, may well be confronted with a completely unfamiliar situation for which no remedy has ever been suggested, and he will have to think out one on the spot. One gathered from Dr. Grey Walter's paper that his ideal astronauts would be chosen for their "rather easy-going, adventurous temperament"; he had found such a temperament to occur in two-thirds of all juvenile delinquents and in one-quarter of people such as paratroopers, skin divers, motor racers, etc., whom he had examined.

However, a little anxiety may be a good thing in ensuring that simple tasks are well done, in the opinion of Dr. R. Beech of the Maudslay Hospital, though it impairs efficiency in the more complicated tasks.

The symposium was led off by Air Commodore W. K. Stewart, O.C. the R.A.F. Institute of Aviation Medicine, with a review of research on excessive *g*; and Wg. Cdr. T. C. D. Whiteside, of the same Institute, then redressed the balance with a paper on weightlessness.

Among the questions raised was that of whether a weightless astronaut would be suffocated by his own carbon dioxide in the absence of convection, because his hot breath is no lighter than the surrounding air when both are weightless. Apparently it has not yet occurred to anyone that this question can be solved on earth without waiting to go out into space. One had, therefore, to point out in the discussion that it is only necessary to lay someone down in a still room and heat up the air till it has the same specific gravity as his own breath; then see if he suffocates.

Flt. Lt. J. Billingham, the Institute's expert on heat tolerance, revealed that the cause of collapse when the body's deep temperature is raised by 1 or 2 deg. C. is that so much blood has gone to the skin, in an attempt to cool it, that there is not enough left in circulation to maintain consciousness.

Dr. N. W. Pirie, of Rothamsted Experimental Station, made the revolutionary suggestion that an astronaut might have electrical energy fed into him as a substitute for food, but he did not go into details. S. W. F. Hanson, of Armour and Co., also discussed space food. Although algae can be used for turning expired carbon dioxide back into oxygen, he disapproved of making the cabin into a self-contained planet by feeding the same algae to the astronauts. Only this year, some volunteers found they could not bring themselves to eat enough of the unpalatable stuff to live on.

Summing up the effects of radiation in space, Dr. P. Alexander and D. Rosen took it for granted that space travellers would have to charge through the newly discovered Van Allen radiation belts on both the outward and homeward journeys. So one had to point out once again, as at Stockholm, that the belts are centred on the geomagnetic equator, that space voyages are not made along the geomagnetic equator but along the ecliptic, that these two planes make an angle of 35° with each other once a day, and that it is therefore quite easy to by-pass the most dangerous part of the belt.

Two purely biological papers completed the symposium. Dr. P. H. A. Sneath stressed the dangers of planets infecting each other through space-travelling carriers, and thought, in disagreement with recently published work, that careful sterilization could ensure that not a single microbe remained on a space probe. And Dr. Harlow Shapley, the famous astronomer from Harvard, discussed life on other planets, pointing out, like most of the experts are content to do, that the creation of proteins in a suitable environment is not difficult to explain.

But protein, though necessary, is not everything. The primary molecule of life is nucleic acid, the stuff of which genes are made. And the creation of a nucleic acid molecule large enough, and of the precise structure needed, to start life going on a planet is a very difficult thing to explain indeed.—A.E.S

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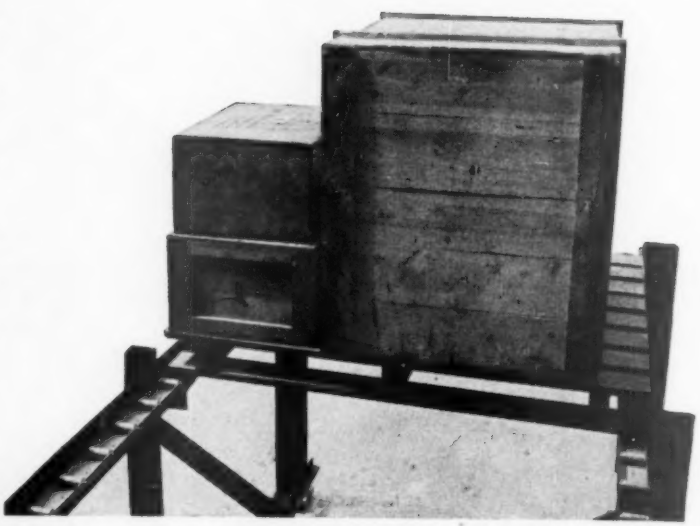

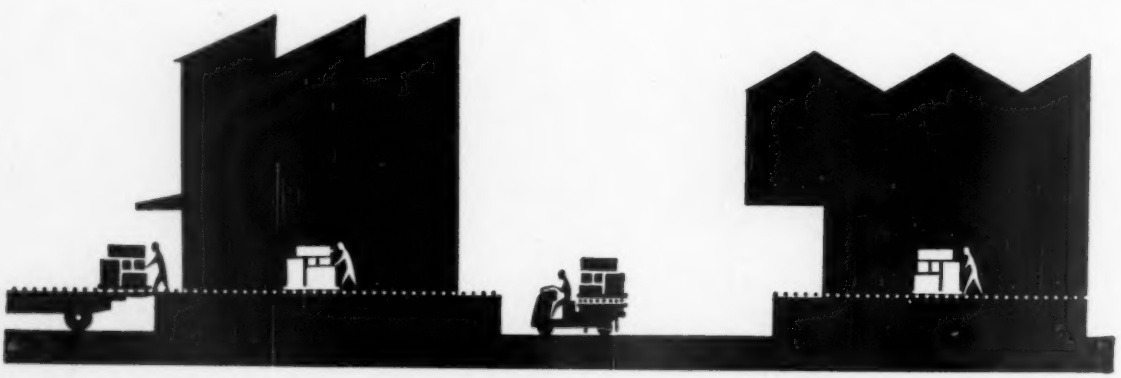

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AIRPORT INSTALLATIONS AND CARGO HANDLING

1 Modern Terminal Layouts

By F. G. Swanborough

OF the half-dozen or so fundamental considerations which determine the size and layout of an airport passenger terminal, none is more important than the facility with which the passengers themselves can move between aircraft and ground transport. The terminal is, in fact, no more than a bridge linking two transportation systems and all other considerations should be subordinated in its design to this primary function. If the smooth flow of passengers in either direction is impeded unnecessarily, then the terminal is less efficient either in design or in operation than it should be; and in consequence will be more expensive to operate.

This may seem all too obvious, but it is perhaps worth re-stating as a fundamental principle at a time when airport and terminal building programmes are being planned on an unprecedentedly large scale throughout the World. There was unconscious irony in the recent American Airlines' description of its new terminal building at New York International, the design of which, the company noted, " was planned around the passenger rather than the airplane—a complete departure from traditional air terminal construction."

If the convenience of the passenger is accepted as the basic and overriding requirement, it follows that the terminal " bridge " will be as short as possible. Ideally, indeed, it would be non-existent; passengers would drive to a vehicle-park adjacent to the aircraft-ramp and transfer straight from car or coach to aircraft, or vice versa. Arrangements approaching this ideal are practised at some airfields in Russia, but at most airports in the Western World the sheer weight of traffic would make it impossible even if the ticketing procedures could be completed on the aircraft (after the manner demonstrated by Allegheny Airlines). The need for Customs inspection, passport control and other formalities on international flights is an obvious further complication.

Accepting, then, that a terminal building will be part of the airport scene for a long time yet, one is led to consider what other factors must be taken into account in its design. A year or so ago eight design criteria for airport terminals were listed by Mr. Thomas M. Sullivan, deputy director of the Port of New York Authority's Aviation Department. Born of experience in developing one of the World's greatest airports at Idlewild, they are worth repeating:

(a) The passengers' movements through the terminal building between ground transport and air transport facilities must be direct and unimpeded.

(b) The building must provide a sound operational plan for the airline and airport operator.

(c) The building must encourage maximum development of concessions (which are the major non-operator source of revenue).

(d) The terminal design must be versatile and adaptable to unforeseen requirements.

(e) The centralized scheme is desirable in all basic air terminal planning.

(f) The desirable aircraft parking arrangement is one of " fingering."

(g) The ultimate central building scheme should be scaled to the capacity of the airport's runways.

(h) The building should be planned to initial requirements with provisions for economical expansion by stages, so that each succeeding plan will be efficient and economical in itself.

As almost every major airport now under development has been in existence for anything from 10 to 30 years, during which time expansion has been continuous, satisfying all these eight points simultaneously has usually proved impossible. And even where new airports are being built from scratch—as is the case with Dulles International at Washington and the airport to serve Brasilia—local conditions as well as the personal views of the planners have led to alternative orders of priority being adopted.

Although Mr. Sullivan argued (point " e " above) that the centralized terminal scheme is desirable, a trend towards decentralized or unit terminal layouts can be detected, with

HEADING PICTURE shows the Theme Structure with high-level restaurant and the elevated rail system for the new Los Angeles International terminal.

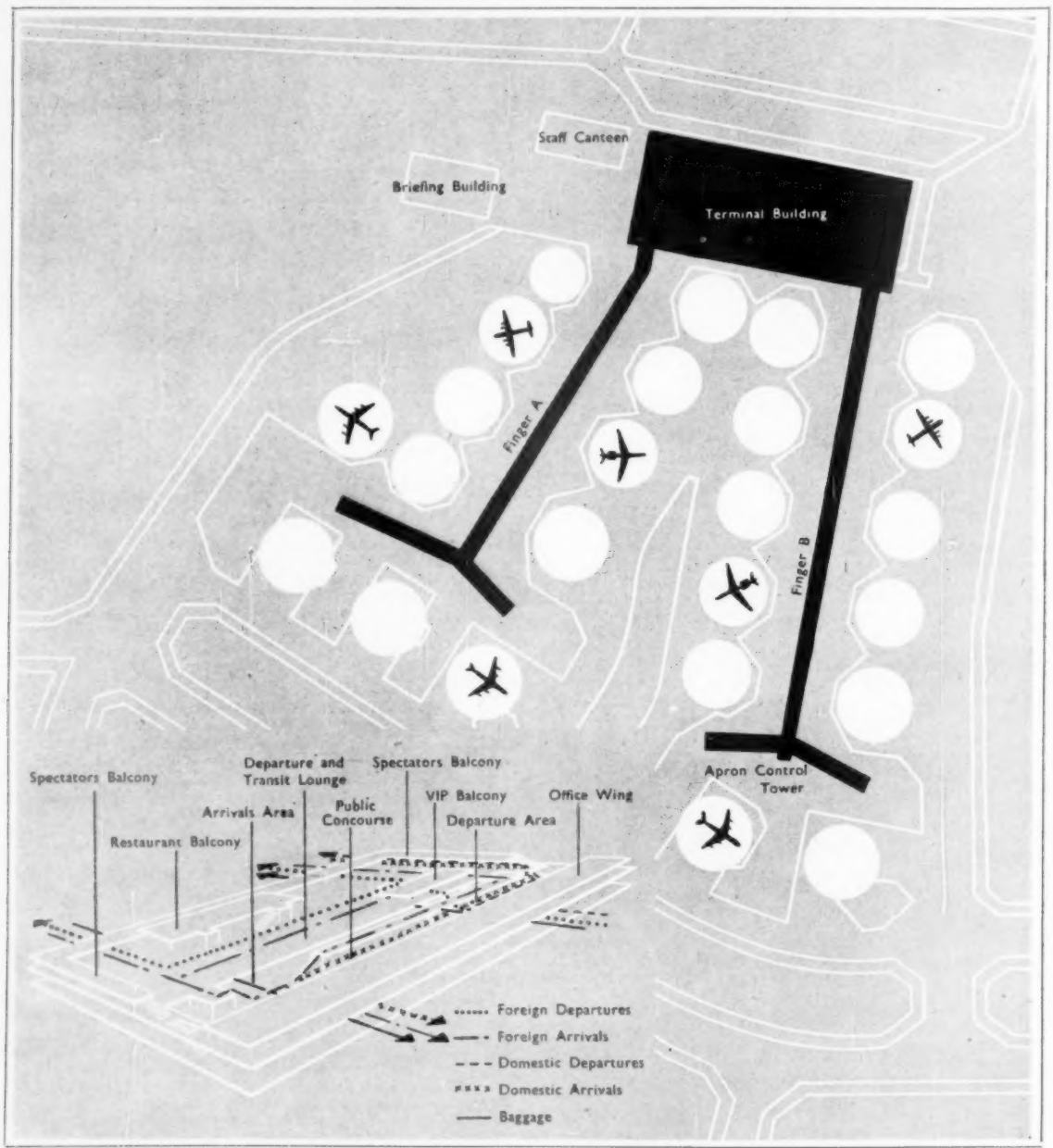
Airport Installations . . . .

New York International itself one of the first major airports to adopt such a scheme. The advantages of centralization, in Mr. Sullivan's view, are its relative versatility, space economy, potential concession income (i.e., all passengers are brought into contact with all concessions) and efficient round-the-clock operation.

However, points "a" to "d" above take precedence and it is becoming increasingly obvious that a single terminal cannot hope to handle efficiently the quantities of passengers already flowing through the major airports each year, while the growing number of aircraft to be accommodated on the apron at one time can lead only to a lengthening of the centralized terminal "bridge" with consequent devaluation of point "a." Decentralization then becomes an operationally desirable feature.

Unit, or decentralized, terminals are commercially attractive as an alternative so long as the amount of traffic available for each unit is sufficiently large for sound development of concession revenues. In the case of New York and Los Angeles, where complete decentralization is being practised, each of six unit terminals will be handling, by 1965, as many passengers as the majority of smaller airports around the World. Other schemes are also being adopted, however, and particular interest will centre next year upon Dulles International with its use of mobile lounges to ferry passengers between terminal and aircraft. This scheme is a refinement of that used at some European airports, including London and Amsterdam. Fundamentally, the use of ground transport on *both* sides of the terminal appears to be wrong, and it remains to be seen whether the mobile lounges at Dulles can successfully bridge the terminal-aircraft gap without impeding the smooth flow of passengers. On paper, at least, the scheme appears attractive enough.

By way of highlighting the various types of terminal layout, descriptions follow of five major airport projects, at each of which a different solution is being adopted. First come



COPENHAGEN INTERNATIONAL.—The layout of this newly opened terminal is of the classic two-finger type. Maximum walking distances are quite high but intelligent use of the building keeps passenger inconvenience to a minimum.

NEW YORK INTERNATIONAL.—The Terminal City at Idlewild, now nearing completion, is one of the first large-scale applications of decentralization in airport planning. Six separate unit terminals, built or building, serve the major U.S. domestic operators, with one main international arrival building, two wing buildings for foreign flag departures and—soon to be built—a tenth structure to handle the smaller U.S. operators and helicopter services. In 1959, the still-unfinished Terminal City handled seven million passengers.

details of the new terminal recently opened at Copenhagen—an example of the classic finger-type layout intelligently applied to local circumstances. New York International, although well known, is described as one of the first significant attempts to decentralize. At Los Angeles, this theme is pursued further, as the description shows, by the use of satellite terminals—also adopted for the new terminal under construction at Montreal. A note on Dulles suggests how mobile lounges can be used instead of satellites to achieve a similar purpose, and finally the novel underground terminal for Brasilia is described.

COPENHAGEN AIRPORT

Inaugurated on Apr. 30, 1960, the new terminal building at Kastrup is the largest in Scandinavia and is planned to serve about two million passengers a year without extensions (about as many, in fact, as each of the six satellites at Los Angeles—see below). A three-storey structure, the terminal has a total floor area of about 430,500 sq. ft., including the two fingers. Each 1,000 ft. long, the fingers are two-level, with passengers using the upper level and the airlines' apron handling and servicing equipment at ground level. Twelve aircraft parking positions are grouped round each finger.

Allowing for the distance inside the terminal, passengers at Kastrup may have to walk as much as one-third of a mile when using the most distant of the aircraft parks. Thus, while the fingers ensure that passengers are conducted safely and under cover to or from their aircraft, they inevitably involve a fair amount of walking. If additional aircraft parks are required in future, one or more extra fingers would have to be added to keep walking distances down to their present level; allowance for this has been made in the design of the terminal.

All the necessary passenger-handling facilities are contained in the one terminal building, with provision for both domestic and international travellers. Baggage, inward and outward, remains on the ground floor at all times. Passengers arriving at ground level proceed to the first floor on which is the main departure and transit lounge containing the airline check-in counters, shops, bar, restaurant and other customary amenities.

Departure from this lounge is at the same level along either finger, via one of three emigration counters. Incoming passengers arrive from the fingers via one of six immigration counters (three for each finger). They then descend from the lounge to the ground floor arrival area, collecting their baggage and passing one of three Customs check-points on the way out.

NEW YORK INTERNATIONAL

Constructional work on an airport at Idlewild began in 1942, and commercial operations began in July, 1948. Planning of what has now become known as Terminal City did not begin until 1950 and, as Idlewild is the first major example of complete decentralization, it is worth studying the sequence of events which led to this arrangement. In 1950, when planning of the new terminal began, it was agreed that Idlewild, as one of four airports in the area (the others are La Guardia, Newark and Teterboro), would be responsible for all New York's international and overseas traffic, plus 50% of long-haul and 25% of medium- and short-haul traffic. This led to a forecast of 5,400,000 passengers annually by 1965, and a requirement for 36 aircraft loading positions with another 14 to be available for later expansion. Required floor space was estimated to be 123,000 sq. ft. and 50% of terminal revenues were to be derived from consumer services and offices on the airport.

On the basis of these estimates, a plan was drawn up for a single terminal building with four fingers serving 36 gates; if 50 gates were wanted, the fingers were to be extended and "moving sidewalks" introduced to cut down walking distances. Customs inspection was to be on the second floor to allow full development of the concessions in the ground floor concourse.

By 1954, however, it was realized that the traffic forecasts had gone badly awry and the figure of 5,400,000 passengers would be reached by 1960. (This, too, proved pessimistic; Idlewild handled 6,994,264 passengers in 1959. This error was partly a result of changes in the anticipated division of traffic between the four New York airports.) In the re-assessment which followed, 50 aircraft stands became the initial target with further expansion required later. By early 1955 it was becoming clear that a single terminal building was out of the question; a terminal to handle the 11,500,000 passengers expected annually at Idlewild by 1965 would need to be two miles long and could still not provide enough aircraft gates adjacent to it.

A fully decentralized terminal was adopted for Idlewild in 1955, to comprise a series of buildings around the periphery of the original island site. These buildings are the International Arrivals Building, which centralizes the Customs and Immigration procedures for all incoming passengers from foreign points; two Airline Wing buildings to handle the departures of all foreign-flag international operators; six unit terminals designed, built and operated respectively by American Airlines, Eastern Air Lines, Northwest Airlines, Pan American Airlines, T.W.A. and United Airlines; and a multi-airline terminal (not yet built) to serve all other operators.

By thus dividing the terminal into 10 separate units, it has become possible to provide 136 aircraft positions, all but 12 of which are directly adjacent to a terminal building, or to

Airport Installations . . . .

a comparatively short finger. The airlines were made responsible for the design and construction of the six unit terminals, but only Pan American has taken the opportunity to depart from a straightforward two-finger lay-out; the Pan American "umbrella" provides for under-cover loading at six aircraft sites, whereas other operators have tended to use telescopic, enclosed Aero-gangplanks, or Jetways, to give protection to passengers right up to the door of the aircraft. In practice, one of the major difficulties of decentralization has proved to be transfer from one building to another of interchange passengers and their baggage. At present, this is done by a coach which makes a continuous, one-way circuit round the Terminal City calling at each terminal once every 15 minutes.

LOS ANGELES INTERNATIONAL

Work on the new terminal for Los Angeles International, as part of a $50 million development programme for the airport, is scheduled to begin this month. With over five million passengers in 1959 and a forecast of 18-23 million by 1970, Los Angeles has been forced to follow Idlewild in adopting a completely decentralized terminal; but there are several interesting differences.

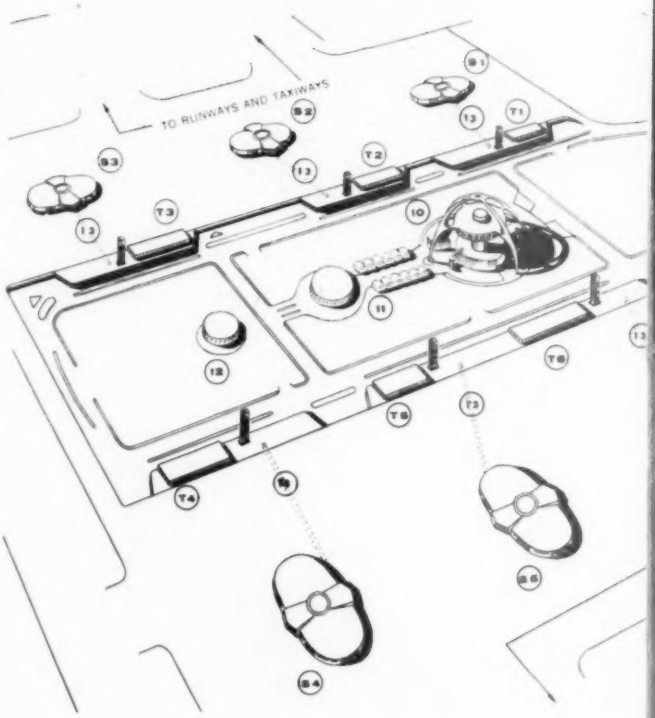
Aircraft stands are grouped around a series of satellite buildings on the apron; each of the seven buildings at present planned has 10 loading gates. These satellites are approached by underground passages from an appropriate ticketing building in the central terminal area. Passengers, having checked in at one of the six such buildings, will walk through the comparatively

SKYLIFT.—An overhead rail-car system will provide transportation between the ticketing buildings in the new Los Angeles terminal.

short tunnel to the satellite, reaching its first-floor departure lounge by way of an escalator. The lounges each contain a restaurant, shops and other conventional amenities, and gates to the aircraft 13 ft. above apron level. Airlines using the satellites will be free to provide their own method of loading to the aircraft. Airline offices and baggage-handling facilities are located at ground level in the satellites, and additional airline offices can be provided in the ticketing buildings.

The latter are located along the sides of the recessed central terminal area, which has a 5,000-car park and the so-called Theme Structure, containing stores, employee restaurants, offices, etc., and a public restaurant 70 ft. above the ground with a panoramic view of the airport. Vehicles on the apron will be reduced to the minimum not only by the use of underground tunnels for passengers and baggage, but also by use of hydrant refuelling.

One of the ticketing buildings (slightly larger than the remainder) and its associated satellite, has been set aside for international operators, of whom there are at present seven, including Pan American. American Airlines, Western Air Lines, United Air Lines and T.W.A., will each occupy their own ticketing building, with the sixth such structure allocated to eight local carriers, including Los Angeles Airways, the helicopter airline. Space provision has been made for one additional ticketing building, not as yet committed. Each building can eventually be extended to three storeys, but initially four will have two storeys and the others one, for a total floor area of 239,000 sq. ft.



The satellite serving the international ticketing building includes the Federal clearance facilities—U.S. Public Health Service, Immigration and Customs. Each of the six satellites has two main floors of 100,000 sq. ft. each, comprising the aircraft operations floor at apron level and the public lobby above. There is also a mezzanine floor and the underground terminal of the tunnel from the ticketing building. A seventh, non-standard satellite is also to be built to give United Air Lines additional facilities. This will be a long, narrow building at the east end of the apron.

In a recent evaluation of four proposed systems for transportation of passengers between the ticketing buildings in the central area, the Lockheed Aircraft Service's Skylift system of overhead rail cars was selected as the most suitable. This system will comprise a 7,500-ft. closed-loop 33-ft.-high overhead track, with ground-level loading and unloading stations at each ticketing building and at the main airport administration building and control tower.

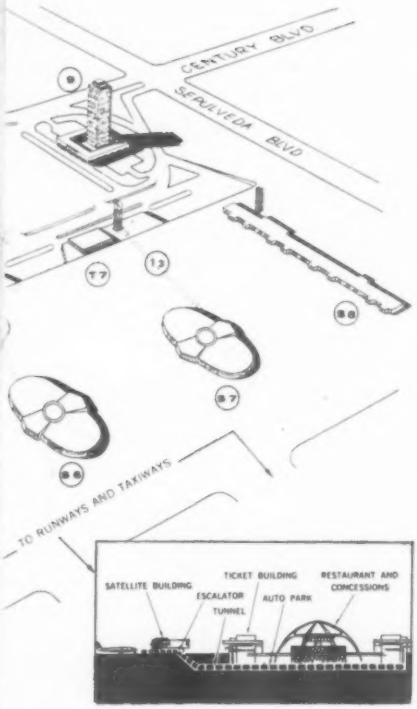
A total of 134 four-passenger cars will be used, and push-button selection will allow passengers to go direct to their destination without intermediate stops; longest journey time will be four minutes. Lockheed will build and operate this system, charging passengers 25 cents a ride—the same as the inter-terminal coach at Idlewild.

DULLES INTERNATIONAL

Expected to be open to operations by the middle of next year, 3½ years after the site was selected, Dulles International may prove to provide the best of all solutions to the terminal design problem, although the traffic-forecast of 8-10 million passengers by 1975 suggests that the size of this problem at Washington is only half that at Los Angeles and New York International. The terminal building itself is a simple rectangular structure, some 600 ft. by 150 ft., comprising a ground and a first floor.

An elevated roadway will serve the first floor, which contains the main departure and arrival concourse. Departing passengers can thus drive to the door of the building and need to

DULLES INTERNATIONAL.—Mobile lounges replace fingers and satellites at the new airport to serve Washington. Walking distances through the two-level terminal building average 300 ft. between road transport and mobile lounge. This diagram also indicates proposed extension of the building to twice the initial length.



LOS ANGELES INTERNATIONAL.—The satellite terminal layout adopted at Los Angeles takes decentralization almost to the limit, but retains a central car park and a few other general facilities. In this diagram, T indicates ticketing building and S satellite. The key to the numerals is as follows: 1, for future construction; 2, international operators; 3, T.W.A.; 4, American Airlines; 5, Western Air Lines; 6, local carriers; 7 & 8, United Air Lines; 9, control tower and administration building; 10, the Theme Structure; 11, central services and utilities buildings; 12, cooling tower; and 13, underground passenger channels.

walk on average only 300 ft. to the mobile lounge. Airline ticketing counters are immediately inside the door, with the usual concessions beyond. Initially there will be 24 "gates" in the long air-side wall of the building, each gate giving direct access at the same level to a waiting mobile lounge. Ultimate plans call for 56 such gates, to provide which the building will be doubled in length to 1,200 ft.

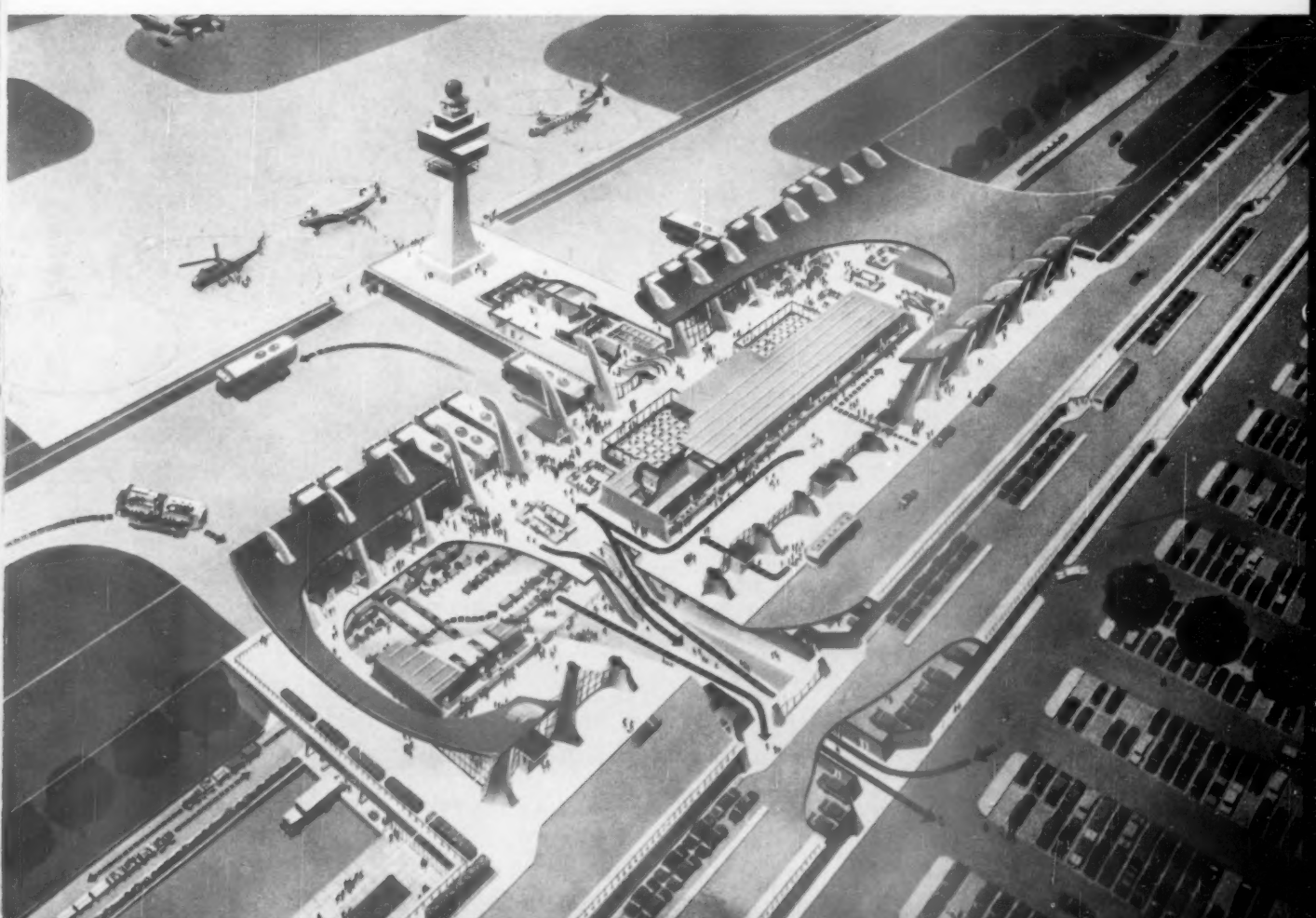
Arriving passengers are brought to these same gates, and descend to ground level by elevators from the main concourse, to collect their baggage. Coaches and taxis to the city terminal depart from this level, and the main public car park for 8,500 cars is in front of the terminal building at a still lower level, connected by elevator to the two terminal levels.

Provision will be made for local-service airlines, executive aircraft and helicopters to park on the apron adjacent to a central wing or finger projecting from the terminal building. Passengers will leave or enter this wing at apron level and will board or deplane by means of conventional steps or ramps. On top of this wing will be a public restaurant and observation platform, and the control tower, topped at 177 ft. by a sphere containing the airfield surface movement radar. Landing pads of 100 ft. diameter each are being reserved in this area of the apron for helicopters.

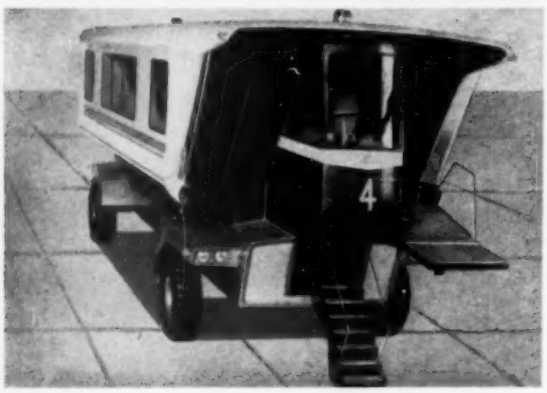
The principal parking area, for jet and piston-engined transports, will be remote from the terminal. At first, the average distance between aircraft and terminal will be about 4,000 ft., but additional aircraft stands to be provided by 1975 will increase this distance to a maximum of three miles. The journey from terminal to aircraft will be made in mobile lounges, each of which will seat up to 90 passengers, with adequate space for carry-on baggage.

Some 54 feet long, 15 feet wide and 17½ feet high, the mobile lounge—now being built to F.A.A. specifications by the Chrysler Corporation with a body by the Budd Company—is believed to be the largest passenger-carrying vehicle ever built to operate on pneumatic tyres. The prototype will be ready for testing next spring—a year or so later than originally intended. A small fleet of lounges will be provided for initial operation at Dulles.

One end of the lounge is designed to link with the terminal building's first-floor gate position and has a door wide enough



Airport Installations . . . .



MOBILE LOUNGE.—Two views of a model of the Chrysler mobile lounge for Dulles International, showing (bottom) the aircraft loading end, with retractable ramps, and (top) the terminal end.

for two-abreast loading. It will seal against the building automatically to exclude draughts and minimize noise. The other end of the vehicle is designed to mate with the doors of all four-engined aircraft in use today, or planned for use by domestic and international operators. A folding ramp at this end is adjustable up or down, and spring-loaded to maintain constant contact with the aircraft even if the latter moves slightly. As a precaution, when approaching aircraft, the lounge has a "feeler" probe which contacts the aircraft first, sounding a horn in the driver's cab and, if necessary, applying the brakes.

Provision is made for the lounge to be driven from either end, so that it will always be driven forwards, and the driver will be in contact by two-way radio with a lounge dispatcher in the terminal and with the airport control tower. Two 150 h.p. engines power the vehicle, one for each pair of wheels, and the gross weight will be 76,000 lb.

The advantages of this idea are fairly obvious. By untying the apron strings which usually bind aircraft to the terminal building, it permits almost unlimited extension of the apron area and aircraft stands as the airport grows. Passengers never need to set foot on the apron and are never exposed to the elements, and the walking distance is reduced to about a third of that at many large airports today. What is more, the cost of the Dulles International terminal is estimated to be one-third less than if a conventional finger arrangement had been adopted.

Disadvantages are the addition of a fleet of vehicles to those already using the apron, and possible delays if sufficient mobile lounges are not available to meet all arriving aircraft immediately they stop. The largest aircraft now envisaged, when operating near to maximum capacity, will require three mobile lounges to handle their passenger load, and this also could lead to delays.

BRASILIA

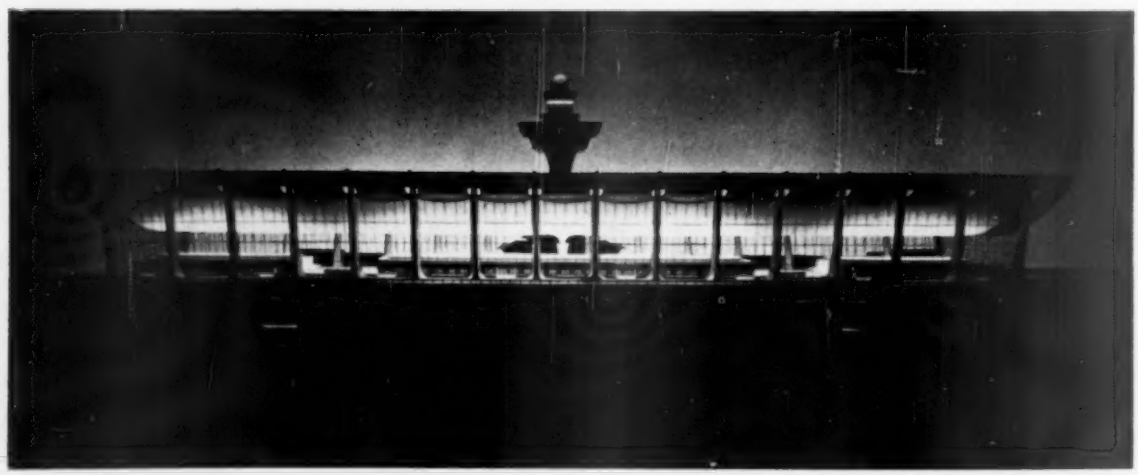
Like Dulles, Brasilia International Airport is being created from scratch, and its conception is as unconventional as is the city of Brasilia itself. The whole of the terminal facilities will be located at two underground levels, beneath a circular apron 1,000 ft. in diameter. At the centre of this apron will stand a hotel, with the control tower on top.

All passenger processing will take place at the lower of the two levels, to which direct road access will be provided for cars, taxis and coaches. Six service points will be provided, on radials from the centre of the apron at a distance of about 250 ft., with complete facilities, and an elevator from each of these points will convey passengers to one of two covered ramps forming arcs around the hotel. Total walking distance, it is claimed, will be only 120 ft. Baggage, meanwhile, will be brought up to the aircraft direct by conveyor belts.

Each of the two parking ramps will have 12 aircraft positions—a comparatively modest total, thought to be adequate because of the steps taken to reduce turn-round times. Permanent underground pipelines to each aircraft park will supply fuel, oil, water, compressed air, electricity and any other services required.

Inbound passengers will descend to the second level by elevator if they are terminating at Brasilia. If in transit, they will alight at the first level and thence go to the hotel until called for their connecting flight.

Two 11,800-ft. parallel runways will be arranged to overlap on each side of the central terminal area, which will be on a slight mound. Consequently about half of each runway will be inclined to have a 1.25% gradient. Take-offs will be made downhill away from the terminal and landings up-hill towards the terminal, serving to reduce both landing and take-off distances and taxi times.



MODEL TERMINAL.—A model of the initial stage of the terminal building at Dulles International, with the control tower beyond.

Airport Installations . . . .

2 Integrating the Air-freight Effort

Trends in the Development of Mechanized Handling and Loading Systems

By

H. A. Taylor

The detachable Rollamat conveyor system developed by Armstrong Whitworth is seen in use here with the Argosy freighter.

DURING the past year or two it has become obvious—to the specialist if not always to those who do most of the talking—that the development of the World's air-freight potential will involve a fully integrated effort by everyone directly and indirectly concerned with the business.

In simplest terms, the traffic will not become available until the rates are lowered and, even with the most efficient of cargo aeroplanes, the rates cannot usefully be reduced until these specialized aircraft are able to operate with high load factors at utilizations which are the maximum possible in relation to their maintenance schedules. For this to be possible, the appearance of more economic freighters and better apron and terminal handling techniques must coincide with an unprecedented sales effort based on a total distribution-cost concept and with the education of shippers and manufacturers towards the idea of offering consignments not at the end of each day or each week but throughout all the 24 hours of each of the days of the year.

Only one thing is certain: the traffic is there. The dozens of studies completed during the past decade may have produced a variety of detailed results—but the answers have been almost unanimous in estimating a potential which is vast in relation to present air-cargo ton-mile levels. A recent survey by Short Brothers and Harland (see our issue of Sept. 23, p. 443) suggested that, on the assumption that manufactured goods can carry freight charges up to 5% of their value, a halving of present freight rates could increase the traffic about fourfold.

Provided that the studies of distribution costs and the associated sales efforts are successful, and that adequate traffic is made available, freight aeroplanes now under development, such as the CL-44, can be operated at costs which would permit a reduction in rates of the order of 50%. But, even with a continuous flow of cargo through the major terminals, the specialized aeroplane is itself only a part of the total air transport system which has to be developed in order that the freighters may operate at load factors and utilizations which will permit this order of reduction in cost per ton-mile and the associated lowering of rates.

Aircraft manufacturers and some operators have more recently been working hard on integrated cargo-handling systems which will help to make practical sense of the projected cargo rates and no big-capacity freighter aeroplane is now being offered without at least an outline of associated mechanized loading and unloading systems.

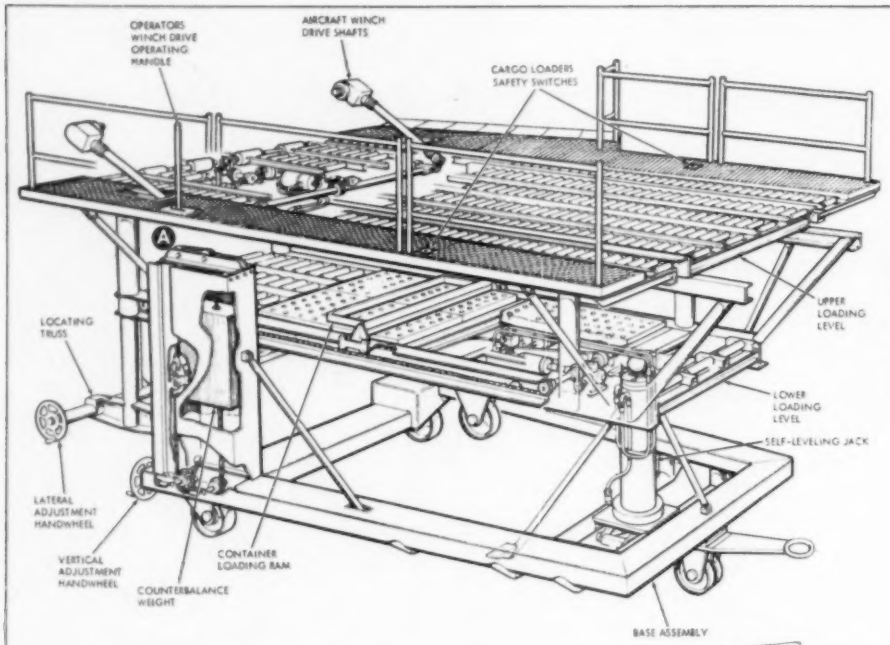
With a series of freighter aircraft actually under construction and on order, Canadair were the first to discuss such systems and have probably, in co-operation mainly with Flying Tiger, gone a good deal further in terms of practical development than any other manufacturer. From the start of the CL-44 concept it was obvious that the manual loading of payloads of the order of 30 tons involved an unacceptable penalty in turn-round times which far more than offset the effect of the losses in payload and hold capacities caused by the use of pallets, containers and mechanical loading equipment.

Nevertheless, such penalties can be considerable, and Canadair set about the design of a system on which volume and payment losses would be at an irreducible minimum. Stiff, thick pallets and rollers were discarded in favour of lightweight, flexible pallets sliding on rubbing strips and controlled by guide-rails. Each pallet weighs 140 lb. and has a thickness of only 0.5 in. The loads—up to 8,000 lb. per pallet—are controlled by throw-over nets and, after the pallets have been winched into position, are restrained by intervening barrier-nets which are attached to the floor and the fuselage wall. Pre-loaded bins have been designed for the underfloor hold, with manual loading for the remaining hold space in the swing-tail part of the fuselage.

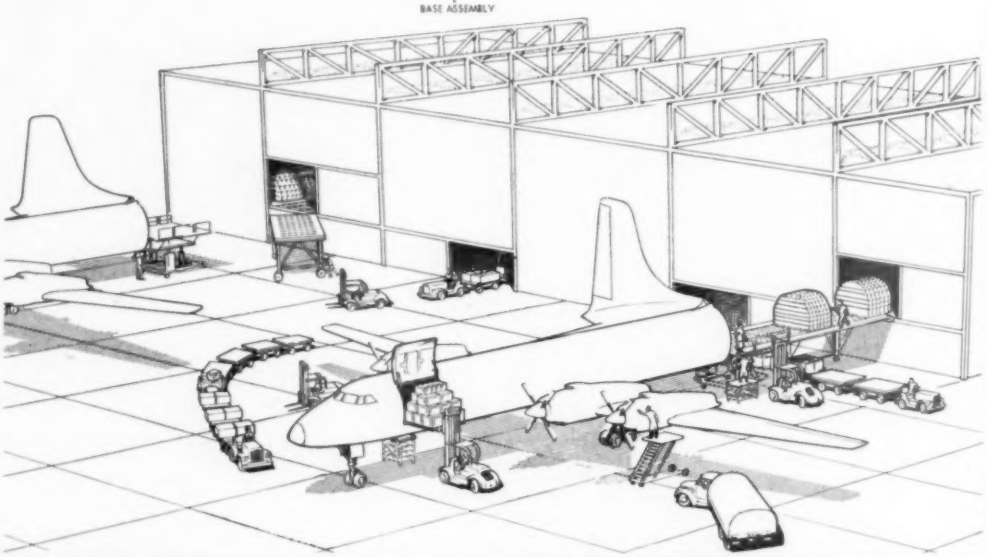
So far so good. But the pallets and bins have to be offered for loading at the right height levels, transport from the terminal warehouse has to be arranged and the terminal itself has to be planned. A number of devices, including traversing and fixed ramps, have been developed for use with a fully organized cargo terminal system. A more immediate requirement has been for a transfer system which can be used at bases with or without the backing of sophisticated terminal and cargo-processing facilities.

A transfer platform has been developed which, when attached to the aircraft, becomes, in effect, an extension of the fuselage and from which pallets and bins are moved to and from the CL-44's upper and lower holds. The platform moves with the fuselage under all conditions of aircraft load and attitude, and corrections of level are made automatically. Canadair describe the operation of the transfer platform in these terms:

"During the time that the swing-tail is being opened, a tubular-frame truss is attached to external lugs on the aircraft



Left is the level loader designed by Canadair for main cargo bases. It will normally be used as a transfer platform between a loading bridge from the terminal and the aircraft, and forms, in effect, an automatically adjustable extension of the aircraft floors.



Right is a sketch showing the layout of a typical cargo main base where the transfer platform, seen in the drawing above, could have maximum value in loading and unloading operations.

under the fuselage and the transfer platform is moved in on its castoring wheels to locate with the truss. Rubber buffers on the forward face of the platform are the only direct contact it has with the airplane. Platform-locating lugs are locked to the truss by pins, and adjustments for final lateral and vertical positioning are by hand-operated screw-jacks. The platform's front supports are counterbalanced to a relief load of up to 1,000 lb. Once in position, two steady-pads at the rear of the platform are lowered to the ground to prevent castor movement.

"The two-level cargo transfer platform is supported on its chassis by a single ball-joint at the rear and rests on hard rubber blocks at the front when not attached to the aircraft truss. The ball-joint incorporates a self-levelling jack and this combination compensates for aircraft deflections about the yaw, pitch and roll axes during loading and servicing operations.

"With the transfer platform attached to the airplane and levelled for loading, a fork-lift truck, overhead monorail, or loading bridge is used to place a container or pallet on the platform upper level where a roller conveyor, set slightly above the aircraft floor level, permits easy movement of the pallet into the airplane until about one-third of its length is inside the open rear fuselage.

"At this point, spring-loaded hook carriers—operated by a chain-and-cable mechanism housed in fixed extrusions on both sides of the aircraft floor—automatically engage with pick-up fittings on each side of the pallet and draw it to a predetermined location in the fuselage. The chain-and-cable system then returns the hook carriers to the loading sill for pick-up of the next pallet, and the sequence is continued until the main compartment is loaded. Unloading is a reversal of this procedure.

"Simultaneously with this operation, cargo bins or containers are placed on the lower level of the platform for loading into the rear underfloor cargo compartment. Handling of cargo on this level is simplified by use of a ball conveyor and standard roller conveyors on the platform and in the aircraft compartment floor.

"To avoid flexing under load and to allow convenient warehouse handling, the lightweight pallets are laid on supporting frames. When loaded, the pallet, complete with frame, can be picked up by a fork-lift truck equipped with a special roller-bed attachment. Design of this attachment permits the rollers to project upward through the frame so that the pallet is supported by the rollers. Pallet stops, which restrain the load in transit, are retracted on reaching the transfer platform and the load is rolled on to the platform deck.

"The transfer platform can take two fully loaded containers or pallets at a time in addition to rear underfloor containers. It can be dismantled for air transport . . . and its use permits simplified loading at any point on the cargo ramp without accurate positioning of the airplane adjacent to the terminal."

Airport Installations . . . .

Proposed base facilities have included double-deck traversing ramps, moving on flush rails in the apron to the prepositioned aircraft. The terminal itself is visualized with two floor levels. The ground floor is used by incoming and outgoing road transport and the pallet and bin loads are made up on that level and transferred to the upper floor by lift.

Transporters carry the loaded pallets to the outgoing-load areas and they are thence moved on to the surface of the bridge ramp and adjustable transfer platform. At less busy airports a simpler system might be employed, with loaded pallets being transferred individually to the mobile scissor-lift platform illustrated on this page. This would raise each pallet in turn to aircraft-floor height and move it into position for picking-up by the aircraft winch system.

The Vickers Super and standard VC10 freighters (see our issue of Sept. 9, pp. 377-378) have capacity payloads of 85,000-90,000 lb. and here, again, the use of preloaded pallets and/or containers, with train loading, is an essential for the necessary reduction in turn-round times. The main-hold containers, if used, are constructed on pallet bases. Nose-loading is used for the main freight hold, side-door loading for the two underfloor holds and under-hatch loading for manually packed freight in the aft section of the rear underfloor hold.

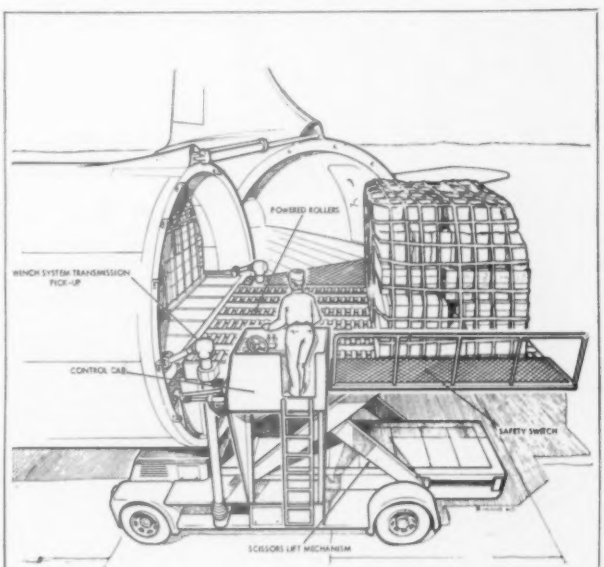
The operating efficiency of the big-capacity freighter such as the VC10 presupposes the use of ground-base facilities matched to the aircraft. Vickers propose a system whereby the loaded pallets and/or containers are transferred to and from the main hold of the aircraft by means of a swinging jetty after the VC10 has been taxied into position under its own power. While loading and unloading are in progress, the aircraft would be serviced, using supply points for fuel, water and ground power.

The swinging, or radially moving, jetty would consist of a chassis, which carries two pairs of wheels running on curved rails embedded in the apron, and a loading platform capable of moving axially on rollers which are interposed between its underside and the chassis. On the top surface of the platform there would be a double-roller track, matching that in the aircraft floor, to take the pallet train.

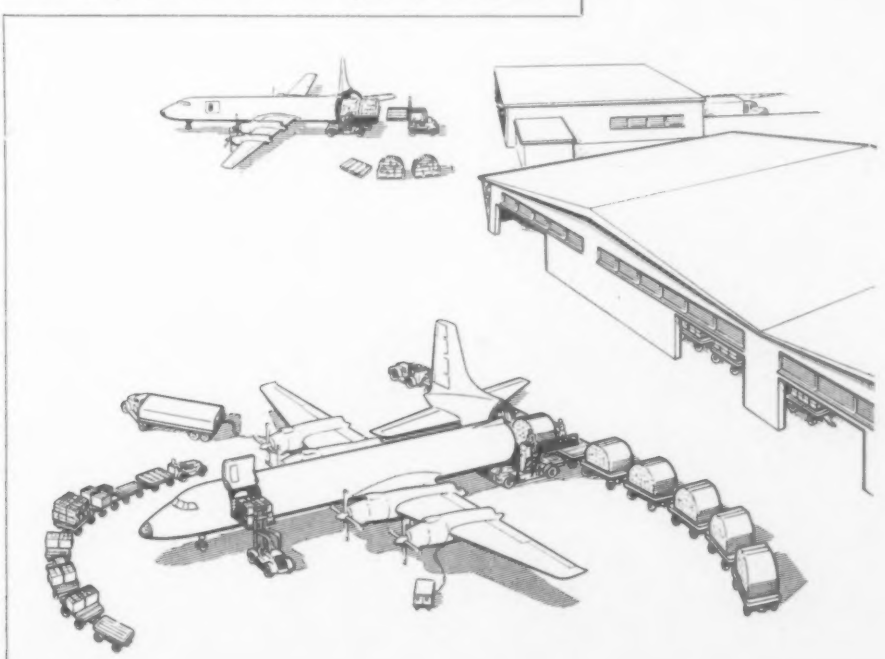
When the VC10 has been positioned on the apron and the nose opened, the empty jetty would be rotated to line up with the aircraft and the platform moved axially to bring its end just clear of the hold entrance. The aircraft's nose would then be jacked up to bring the hold sill level with the platform and the pallet train in the aircraft would be unlocked and drawn on to the platform. The jetty would then be swung back and lined up for the incoming train to be off-loaded and the outgoing train to be run on to the platform in its place. Afterwards the jetty would be rotated to line up with the aircraft and the outgoing train would be winched aboard. The underfloor holds would, meanwhile, have been unloaded and loaded, using apron vehicles.

Obviously such a system could be economically installed only at airports where the VC10 freighter is a regular visitor. For others there would be a requirement for a loading dock which could be used with all the different freighter layouts and loading systems. Vickers have designed an adaptation of the swinging jetty in which the loading platform has a range of height adjustment between 44 in. and 144 in. The loading platform would be mounted on a frame which is raised by hydraulically operated scissor links from the jetty chassis. Such a unit would have the ability to lift pallets from truck-bed height to the level of the aircraft hold. For intermediate airfields, conventional mobile vehicles, with adjustable roller-tracked platforms, might be used.

The immediate problems involved in loading and unloading are reduced for freighters with low sill heights. Thanks to its high-wing layout and double-curvature fuselage section, the A. W. Argosy's floor is at about the same height as the floor-bed

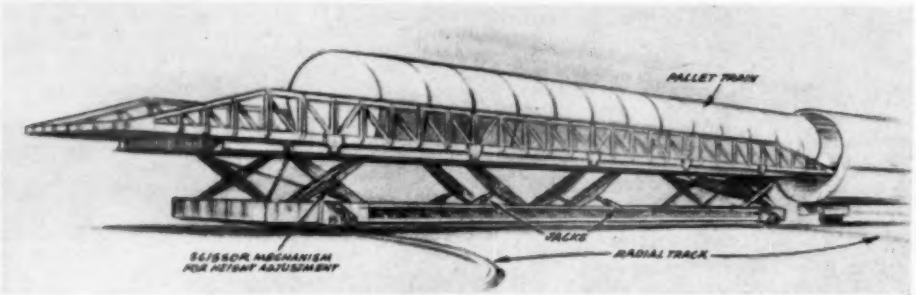


For intermediate-base operations the Canadair scissor-lift loading platform (above) might be used. This is mobile and self-contained.



The uses of the platform-vehicle above are shown in the sketch on the left during minimum - turnround - time (below) and minimum personnel operations at an intermediate - size base.

Airport Installations . . . .



For varying aircraft floor levels and terminal systems, Vickers-Armstrongs propose this adjustable adaptation of the platform for the swinging-jetty system shown in the drawings at the foot of the page.

of the average truck. The Lockheed Hercules is another low-loader and its manufacturers recommend a loading system which involves the use of a long flat-bed trailer on which five palletized loads, locked together, are hauled from the loading dock. The trailer has an electric winch which pulls the loads on to the twin rollers of the flat bed and, later, over the door ramp of the Hercules and into the hold. The civil futures of the Hercules and of its projected development, the GL-207 Super Hercules, are still in doubt but, like other manufacturers, Lockheed have done a great deal of cargo-handling development and civil cargo sales investigation work.

Coincidentally with the development of the Argosy, Armstrong Whitworth designed their Rolamat cargo-handling system, using pallets and (in the case of the Argosy) four rows of detachable roller conveyor sections for the aircraft floor, the bridge ramp and the loading truck. The system was designed to be applicable for cargo transfer and handling with many kinds of transport, but its primary applications are in the air-freighting rôle.

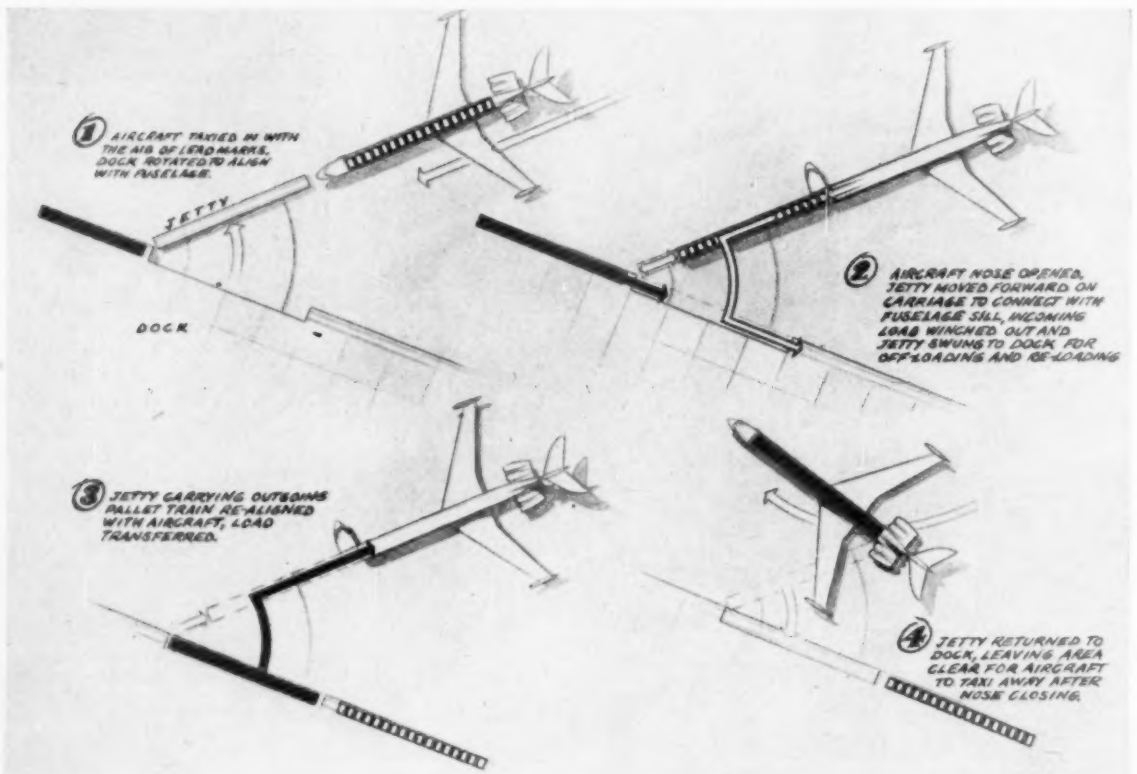
The pallet used with the aircraft system is a flat type made of light alloy; it weighs 167 lb. and has a working load of 8,000 lb. Eight of them complete the standard system for the Argosy and the set, including roller conveyors, guidance rails, end stops, spacer-bar assemblies and guide blocks, involve a payload penalty of 1,690 lb.—or 6.2% of the capacity payload.

Meanwhile the various concepts of terminal freight handling still remain in a somewhat fluid state. The fact that this article, with its outline of developments and trends of thinking, is illustrated by drawings and sketches rather than by photographs of actual hardware, demonstrates, as effectively as anything, this present uncertainty.

The programme for the civil operators is, however, becoming clearer and Canadair, for instance, has been able to announce a fairly positive series of apron systems and terminal-layout projects which have been developed in co-operation with the U.S. all-cargo carriers who have placed orders for the CL-44. But other manufacturers, one or two of whom have been working on projected systems, tend to be inhibited in any public statement of plans by the wide variety of requirements being considered in the military as well as in the civil fields.

During the coming 12 months the first of the big all-freight aircraft will be in service, the requirements will have become more firm and some of the prototype systems will have gone into day-to-day use.

A year from now the results of the essential integration in a total air-freight development effort will begin to be seen.


1 AIRCRAFT TAXIED IN WITH THE AID OF LEAD MARKS. DOCK ROTATED TO ALIGN WITH FUSELAGE.
JETTY
DOCK
2 AIRCRAFT NOSE OPENED. JETTY MOVED FORWARD ON CARRIAGE TO CONNECT WITH FUSELAGE SILL. INCOMING LOAD WINCHED OUT AND JETTY SWUNG TO DOCK FOR OFF-LOADING AND RE-LOADING
3 JETTY CARRYING OUTBOUND PALLET TRAIN RE-ALIGNED WITH AIRCRAFT. LOAD TRANSFERRED.
4 JETTY RETURNED TO DOCK, LEAVING AREA CLEAR FOR AIRCRAFT TO TAXI AWAY AFTER NOSE CLOSING.

The sequences in the swinging-jetty loading system proposed by Vickers-Armstrongs for use with the VC10 and Super VC10 freighters. The successive actions for unloading and loading are described in more detail in the text on the previous page.

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constant frequency AC generating system has been specified for the Victor B.2.

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AIRPORTS and refuellers are window displays. Both are the "end products" of an attitude towards life. A traveller's glance at London Airport tells no more about the English character than the sight of a refueller can tell him about the calculated hustle that animates Esso.

"Calculated hustle" needs explanation. Three years ago six men took 25 minutes to fuel a DC-6 with 5,000 Imperial gallons. The new Esso Python, manned by only two men, can supply 12,000 gallons to a Boeing 707 in 12 minutes. Calculated hustle explains the difference.

Hustle is not haste which gives an impression of urgency, backed by inexperience. Calculated hustle means a near-surgical swiftness born of training, planning and anticipation, with a solid background of scientific research.

It begins slowly. Take the training of a refuelling crew for example. For two months or more a new man works under the close supervision of his crew chief before he can qualify as a fully fledged crew member. He receives practical and theoretical instruction from a man wise in the ways of fuelling aeroplanes, and whose experience is kept up-to-date by courses at Esso's training school.

Then there is quality control, a progressive system of checks, all of which contribute to the speed, safety and efficiency of the final operation. From the refineries and ocean-side storage tanks, aviation fuel — already tested to rigid specification — is delivered by road to Perry Oaks, the fuel farm at London Airport where more than a million gallons of fuel are stored. There it is sampled and filtered before delivery to Esso's satellite depot, with tankage for another half-million gallons, at L.A.P. Central.

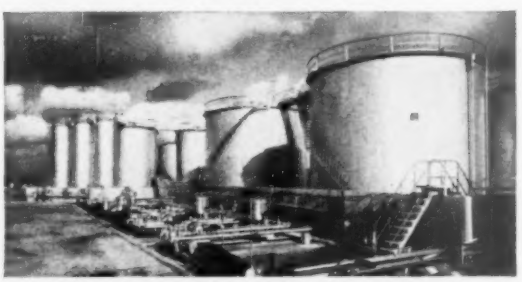
From these tanks it is fed to the refuellers after more checks and filtration. And each refueller is inspected daily, an inspection which includes all its safety equipment as well as final tests to make certain that its load of aviation fuel is free from contamination.

Quality control is backed by the experience and ultra-modern facilities of a first-class research organization. Esso's scientists look towards tomorrow but keep an eye on the run-of-the-mill problems of to-day. Not only do they experiment for the development and improvement of Esso's future products: they analyse and test samples of current fuels and oils and devise test procedures and equipment for use in airport tests for fuel cleanliness.

L.A.P. Central Area from the air. The S.E. face passenger handling building is at the centre, the Eastern Apex building on the right.

Advance planning is another factor. Every day a schedule is compiled in Esso's operations room at London Airport Central, giving estimated times of arrival and probable fuel requirements for each aeroplane needing Esso service in the following 24 hours. And an up-to-the-second communications system keeps Esso's controller in touch with latest developments so that he can direct the refuellers accordingly.

So much for the background. Trained crews are ready. Product has been tested all down the line. The programme is planned. Refuellers have been checked and are waiting to swing into action.



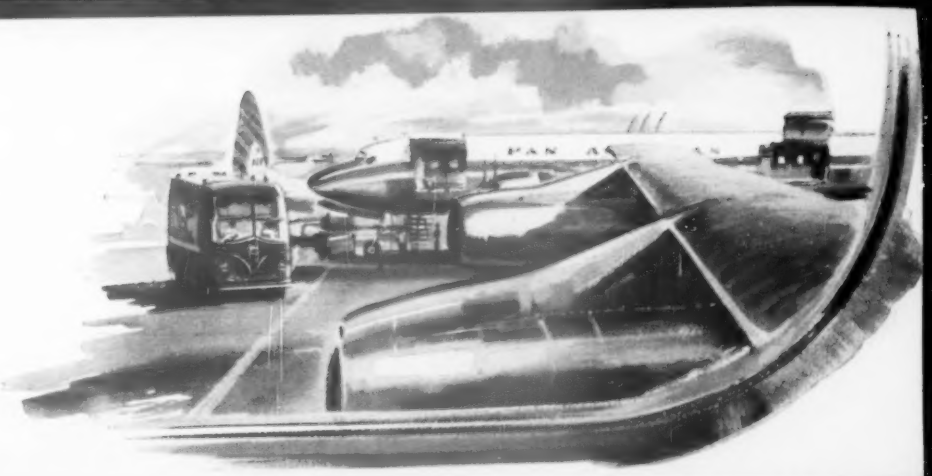
Part of the one million gallons of tankage which constitutes Esso's fuel farm at Perry Oaks, adjoining London Airport.

An incoming airliner, still some distance away, is reported by Air Traffic Control. Esso's controller is informed by teletype direct from the tower or by landline from the operator. The controller alerts the appropriate refueller crew either directly or by radio via the apron supervisor. In less time than it takes to tell, the refueller is on its way to the arrival area. Soon the aircraft taxies in and rolls to a halt. Within three minutes refuellers and other servicing equipment are correctly positioned, all safety precautions have been taken, hoses deftly and swiftly coupled, and the fuelling operation begins under the watchful eye of the apron supervisor.

Perhaps the airliner is one of the big jets, thirsty and impatient after a trans-Atlantic flight. Then the refueller will be the Python, huge, red and dependable — a big answer to a big need. For other aircraft or lesser requirements, smaller special-purpose refuellers may be more suitable, like the 6,000-gallon Pluto. Whatever the aeroplane and whatever its need, the appropriate vehicle will be there, ready to supply what is wanted, where it is wanted and just when it is wanted. That is the principle of Esso service, applied with characteristic hustle which is Esso's speciality. That is how customers are satisfied and why Esso's business is expanding at London Airport.

Calculated hustle enabled the refueller crews to supply 30,000,000 gallons of aviation fuels to Esso customers last year at London Airport alone. This year's estimate is over 50,000,000 gallons. As for the future—when Esso development and research evolve still better fuels and oils, and when a pipeline links the mighty Fawley refinery to London Airport—new requirements will be met safely and swiftly in the same tradition as they are to-day, in the spirit of calculated hustle that a passenger may casually notice but a glance will never explain.

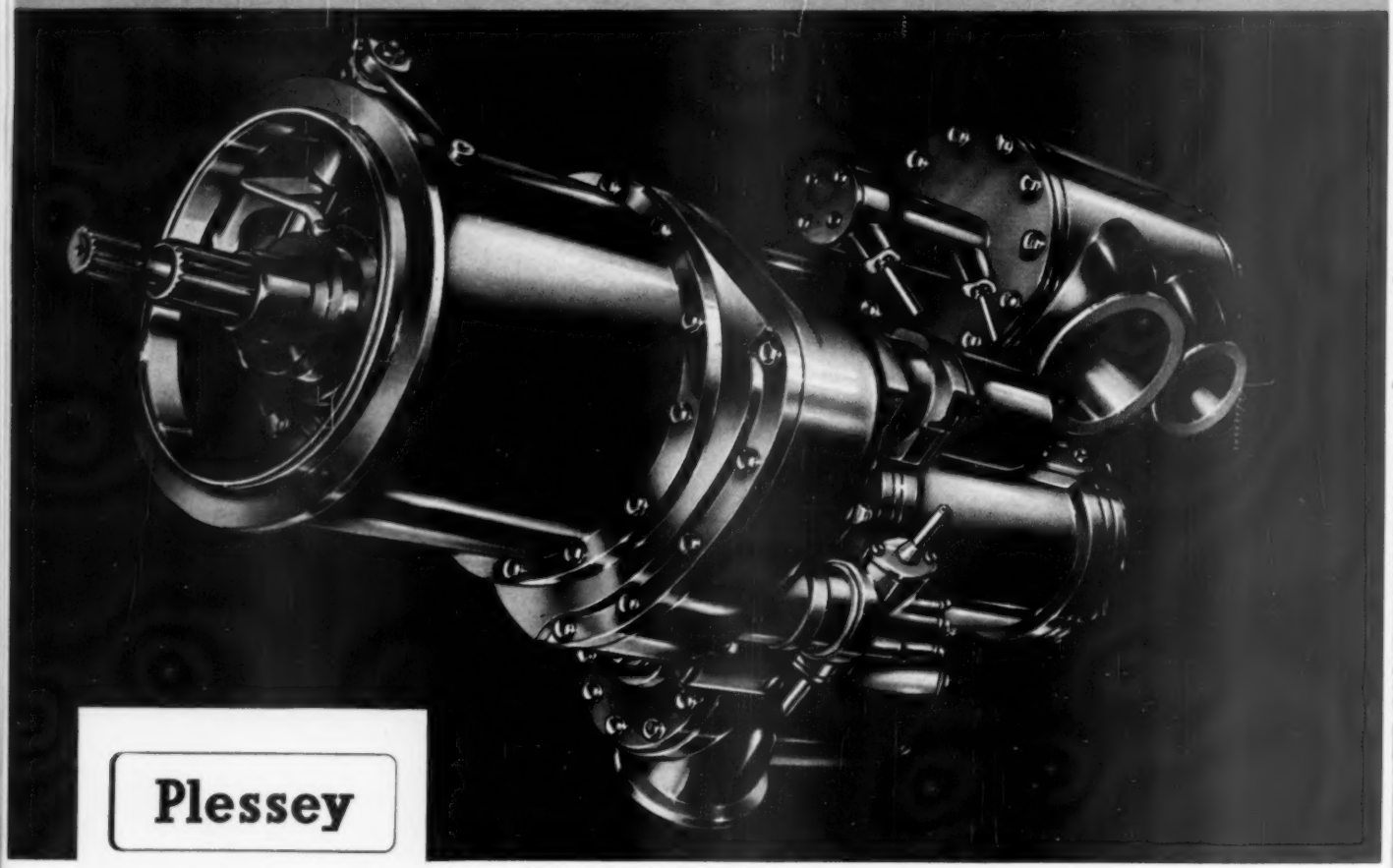
Esso Petroleum Company Limited
Aviation Department
36 Queen Anne's Gate, London, S.W.1
Telephone: HYDe Park 7030



At the receiving end of calculated hustle: view from a cabin window of a Boeing 707 on the fuelling apron.

1615 on a winter's day at London Airport. A Boeing 707 of T.W.A. en route Frankfurt-New York receives fast Esso service.

Another Plessey development for a.c. generation



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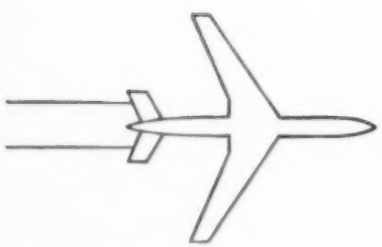

(* *Patents applied for*)

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Publication No. 351 gives further details of this new and important Plessey project.

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Airport Installations . . . .

3 Approach and Transition Aids

Capt. B. O. PROWSE discusses, from the transport pilot's viewpoint, problems, failures and progress in the development of aids for instrument approach and transition to visual flight.*

EXPERTS would say, I am sure, that it is psychologically deplorable to start an article of this kind by stating that I have a feeling of despondency whenever the subject of the title is mentioned. This is too bad, because it is exactly how I do feel. There are many reasons for this despondency, and I shall start by telling a short story that will demonstrate one of the most provocative of them.

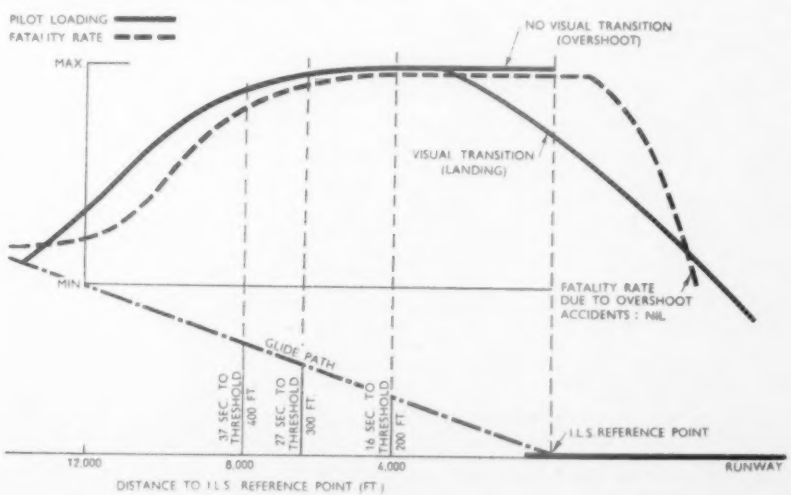
Just over 10 years ago a certain airline captain started to fly a very fine aeroplane called the Boeing Stratocruiser on regular transatlantic service. This aeroplane was fitted with a Sperry automatic approach system. If operated correctly on an ILS localizer and glide path, this automatic approach system could take our captain safely and accurately down to 200 ft. and place him in a position from which he could easily land the aircraft. The minimum meteorological limits to which this aeroplane was operated were 200 ft. cloudbase and half-mile visibility—except at London Airport where the excellent Calvert approach lighting system made a visibility down to 400 yd. possible.

Seven years later the same captain progressed to flying one of the World's leading long-range turboprop airliners on the same route. This aeroplane also had a very satisfactory automatic approach system which, if operated correctly, could take him safely and accurately down to 200 ft. and place him in a position from which he could easily land the aircraft. The minimum meteorological limits to which this aircraft is still operated are 200 ft. and half a mile. I should mention here that the automatic pilot on this turboprop incorporated the invaluable feature of individually switched control channels. Thus, if the glide path were unserviceable or inaccurate, the elevator channel could be switched out and the elevators operated manually, leaving the auto-approach system to hold the aeroplane to the localizer on aileron and rudder channels. On a good localizer with a well-maintained automatic approach system in conditions of no drift, it was possible to *land* automatically on aileron and rudder channels, while controlling manually on elevators.

Now, 10 years after starting on the Boeing Stratocruiser, our captain is flying a Boeing 707. This aeroplane also has an automatic approach system (though without individual control-channel switching) that can take him safely and accurately down to 200 ft. and place him in a position from which he could easily land the aeroplane. The minimum meteorological limits to which this aeroplane is operated are 300 ft. and half a mile—except in the United States, where no commercial turbojet can operate below 300 ft. and three-quarters of a mile.

You will notice the monotonous similarity in the meteorological operating limits during the first nine years and the final backward step up to 300 ft. and ½-¾ of a mile in the tenth year. This is the "inverted" progress from which the airlines have "benefited" over those 10 years. The economics add up to a large sum of money in the red, representing the cost of the automatic equipment in all these aircraft, from which no benefit from increased operating efficiency through improved regularity of operation to destination, has been obtained. The automatic approach feature has made, and still makes, in almost all cases, no difference to the minimum meteorological operating limits.

What a decade of stagnation and wasted money! Investigation into degrees of responsibility for this situation would reveal a small field. I regret to say that in my personal opinion the two dead-heat leaders in this field are the airline managements and the pilots. Inventors, designers and manufacturers would be almost entirely in the clear.



This composite graph effectively stresses the close relationship between the degree of pilot-loading and the fatality rates (1948-58) for different stages of final approach.

Economic Urgency of Solutions

Before I enlarge upon this rather traitorous-sounding statement, let me say that there is no doubt that the recent complicated change-over to turbojet operations has tended, understandably, to distract attention of most airline managements from almost all other spheres of operation. But now, having completed enough of this transition to have time to look around at how we stand, what do we find? Some beautiful aircraft to fly, with great economical promise, but with the highest operating limits for 10 years. Another winter is coming along, with every possibility of London Airport being due for some more of those devastating fogs, such as those which reduced B.E.A.'s profits by about a quarter of a million pounds in 1958-59.

The seriousness of a diversion has more than doubled since that winter. For instance, Prestwick and Gatwick are the two airports in U.K. that receive the brunt of the blow when fog hits London. Think of the situation that will arise when, say, three B-707s, with only 75% load, divert to either of these places, disembarking close on 300 tired, irritated, questioning passengers. It is quite certain that the chaos is going to be very complete. Unfortunately, development in the traffic-handling side of the airline business has got just as far behind that of the aircraft as has progress towards all-weather airline operation. Cleopatra in her barge on the Nile was more likely to reach her destination, *with* her baggage, in conditions of 400 yards visibility, than is the airline passenger 2,000 years later. Rather a sad thought, isn't it?

Reasons for Slow Progress

Let us just have a look at that field of responsibility to which I referred, and at my blame of both pilots and managements.

In most airlines an operating captain of considerable seniority has the job of running a unit known variously as a Fleet, or a Flight, or by some such similar name. He

* The author is a senior captain with B.O.A.C. His airline flying experience started with British Airways in 1938. He has been on the North Atlantic run for the past 17 years and is now flying 707s. The opinions expressed in this article are his own.

Airport Installations . . . .

usually has under him two or three executive operating pilots. He is responsible for the operation of a certain number of the airline's aircraft and the accompanying crews. Being thus responsible, he should see that his aeroplanes are fitted with *serviceable* flight director and/or automatic approach systems, and that his pilots *can* and *do* use this equipment. I should be absolutely amazed if as many as 50% of the route-operating pilots of any airline regularly use the automatic-approach equipment on their aircraft. By no means all of them even use the flight director system available to them for manual approaches.

It is not natural for intelligent human beings such as pilots to fail to take advantage of equipment that could make their job much easier. There must be, and of course there are, reasons for this apparently paradoxical situation. Among these are:—

1. In the case of pilots on long-range routes, the number of instrument approaches they do per annum can be very small. They therefore need all the practice they can get to retain their proficiency at manual approaches while they are on the routes. (This is no excuse for not using the flight director system available for manual approaches, but point 3 below is such an excuse.)
2. It has become a habit in many airlines not to place the maintenance of approach equipment at the same high priority as the rest of the aircraft, because it is not essential to the *safety* of the aircraft. This, I consider, is one of the most mistaken policies possible. When a pilot uses his automatic-approach equipment he can, if it is properly maintained, operate much more accurately to limits as low as, or lower than, with manual operation.
3. Progress towards equipment and component reliability has left a trail of breakdowns, sometimes taking place at rather annoying moments on an approach, and these have left a very understandable distrust for all "black boxes" in the minds of all pilots.
4. In many cases sufficient training and practice are not available to pilots to allow them to obtain the highest proficiency and confidence in automatic equipment. Insufficient emphasis is laid on its importance.

Make no mistake; none of this means any reduction in the safety standards to which airlines operate. The meteorological operating limits are set high to match the circumstances. But the above reasons are valid, and responsibility must be shared by air line managements and pilots. It is clear now, I hope, that a very complicated situation is at hand which requires careful thought and planning by *all*, including the route operating pilots, who are themselves the central figures. Without their acceptance and use of automatic-approach equipment, no progress can be made towards the fully automatic landing.

I have mentioned all this to emphasize the dire need for progress towards 100% all-weather operation. Fortunately the situation is not all gloom. Those concerned in this matter have now got together and devised a plan. This plan has been divided into three phases:—

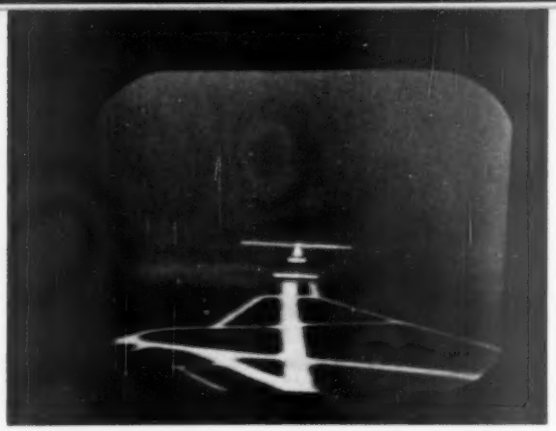
1. To operate large jet aircraft down to current minima.
2. To reduce operational minima for all types of aircraft.
3. To progress towards a safe and regular landing in all weather conditions.

In my opinion, if a wider, more urgent and more farsighted interest had been taken in this problem by both pilots and airline managements, the first phase of this plan would have been unnecessary.

Contemporary Developments

The inventors, designers and manufacturers are coming out with some excellent ideas and equipment. One example is the Smiths Para Visual Director which could be of great use in, at any rate, two phases of the plan. This director consists of three display units placed around each pilot, one in front of him, and the other two symmetrically on each side. All three are sensibly in a horizontal plane slightly below his head. Each unit consists of a servo-driven cylinder, with a black and white helix inscribed on its surface. Rotation of the cylinders gives the illusion of longitudinal motion from the pattern of the helix. The unit ahead of the pilot provides demands for bank, while the two each side, which are slaved together, provide for pitch. The whole system results in an extremely natural display producing instinctive pilot reaction. It is obvious that this system can be of great assistance during an automatic or a manual approach.

There has been a great deal of experimenting done in various approach and landing lighting systems, with the emphasis now on a "natural" display on the runway itself for easy transition from instrument to visual flight and with strobe lighting to improve guidance in the early transition stage.



The way in which a collimated windscreen display is superimposed on the "real" world is seen in this photograph of the horizon bar and two perspective track-lines of the R.A.E. display shown in a flight-instrument simulator at Farnborough. This "head-up" director presentation was described in our issue of Oct. 30, 1959, pages 414-416.

A great deal has been done at the Blind Landing Experimental Unit and by several organizations in the electronics field in the United States, in progress towards an acceptable fully automatic landing system. Automatic speed control, automatic flare and various separately derived approach monitors are included in this progress. Some of the more advanced thinkers, having got so far, are now pausing to assess developments. It may be that electronics will be able eventually to achieve a satisfactory fully automatic landing system. But not nearly yet. There is an enormous bridge to cross in the training and mental processing of pilots from their present state in the art to acceptance of fully automatic landing. It is no good trying to rush this progression. Many advanced thinkers are now agreed that it will be achieved with least difficulty through "head-up" semi-visual means.

Following on this line of thought, various collimated windscreen display systems are being developed. These systems normally incorporate a horizon bar including a heading reference, some form of flight-path control element, and an image for guidance to the runway. These appear to be out in front of the windscreen, and merge naturally with the real horizon and the runway position, "angle" and shape. Certainly speed and probably altitude will have to be included somewhere in these displays.

The "head-up" display system removes that most dangerous and difficult of all the feats a pilot now has to perform—the transition from cockpit (IFR) to visual reference for landing. Psychologically the "head-up" type of display should greatly ease progress through lower operating limits to fully automatic landings. A glance at the graph will bear out the soundness of this plan. Highest death rate and highest pilot "loading" occur at the point in the approach at or immediately before visual transition. Even if we cannot completely get rid of the problem by these means, we can certainly lessen its dangers immeasurably.

Summary

There are very many other developments in progress which are aimed at all-weather operation, but which I have no space to describe. Details are available in great profusion from designers and manufacturers. Equally important is the necessity:—

1. For airline managements and pilots to become more aware of the urgency of this problem—and most particularly that part of it relative to the methods to be used to obtain pilot acceptance of the change-over from present conditions to those of fully automatic landings.
2. For airline managements to place the standard of maintenance of equipment on the aircraft used for manual and automatic approach at the highest priority.
3. For simulator designers to get down to the job of designing a simulator that can really be used for pilots to practise manual and automatic approaches and manual landings on: they can then concentrate on using automatic approaches on route operations when it comes to delivering 170-odd passengers to their true destination in conditions at or below 200 ft. cloudbase and ¼-mile visibility.
4. For international agreement to be reached on the ground aid to be used for azimuth guidance for fully automatic landings.

I agree that the attachment of blame solves few problems—especially, as in this case, when the faults are so very excusable—and these are, after all, only my own opinions. The point is that the pilots are the central figures in the solution of this complicated problem, with the airline managements holding a great responsibility for the achievement of success.

4 Equipment and Installations

A quick-reference guide to the British companies associated with airport construction, and manufacturers of fixed installations and portable equipment for airport use

AIRPORT CONSTRUCTION: ***Runways, Terminals and Hangars***

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BOLTON GATE CO., LTD., Waterloo Street, Bolton, Lancs.
BRITISH INSULATED CALLENDER'S CONSTRUCTION CO., LTD., 30 Leicester Square, London, W.C.2.
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S. M. D. HAWKSLEY, LTD., 2 Buckingham Avenue, Slough, Bucks.
HEAD WRIGHTSON ALUMINIUM, LTD., Stockton Forge Works, Norton Road, Stockton-on-Tees.
JOHN LAING AND SON, LTD., London, N.W.7.
SIR ROBERT MCALPINE AND SONS, LTD., 80 Park Lane, London, W.1.
PROCTER BROS. (WIREWORKS), LTD., Monkbridge Mills, Whitehall Road, Leeds, 12.
WESTLAND ENGINEERS, LTD., Yeovil, Somerset.
GEORGE WIMPEY AND CO., LTD., Hammersmith Grove, London, W.6.

FIXED INSTALLATIONS: ***Approach, Runway, Taxi and Apron Lighting***

BUTLERS, LTD., Atlantic Works, Grange Road, Small Heath, Birmingham, 10.
ENGINEERING AND LIGHTING EQUIPMENT CO., LTD., Sphere Works, Campfield Road, St. Albans, Herts.
THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.
HARLEY AIRCRAFT LANDING LAMPS, St. Neots, Huntingdonshire.
HOLOPHANE, LTD., Elverton Street, London, S.W.1.
C. MAURICE CONTRACTORS, LTD., Lindsey Road, Bishop's Stortford, Herts.
REVO ELECTRIC CO., LTD., Tipton, Staffs.
STONE-CHANCE, LTD., Gatwick Road, Crawley, Sussex.
THORN ELECTRICAL INDUSTRIES, LTD., Gt. Cambridge Road, Enfield, Middx.

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AIRMEC, LTD., High Wycombe, Bucks.
BRITISH COMMUNICATIONS CORPORATION, LTD., Coronation Road, High Wycombe, Bucks.
BURNDEPT, LTD., West Street, Erith, Kent.
COSSOR COMMUNICATIONS CO., LTD., Cossor House, Highbury Grove, London, N.5.
COSSOR RADAR AND ELECTRONICS, LTD., The Pinnacles, Elizabeth Way, Harlow, Essex.
CREED AND CO., LTD., Telegraph House, Croydon, Surrey.
THE DECCA NAVIGATOR CO., LTD., Decca House, 9 Albert Embankment, London, S.E.11.
DECCA RADAR, LTD., Decca House, 9 Albert Embankment, London, S.E.11.
EKCO ELECTRONICS, LTD., Ekco Works, Southend-on-Sea, Essex.
ELLIOTT BROTHERS (LONDON), LTD., Boreham Wood, Herts, and The Airport, Rochester, Kent.
E.M.I. ELECTRONICS, LTD., Hayes, Middx.
FERRANTI, LTD., Hollinwood, Lancs.
THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.
MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Chelmsford, Essex.
MECHANISM, LTD., George Street, Croydon.
MUIRHEAD AND CO., LTD., Beckenham, Kent.
MULLARD EQUIPMENT, LTD., Mullard House, Torrington Place, London, W.C.1.
R. W. MUNRO, LTD., Cline Road, London, N.11.
MURPHY RADIO, LTD., Broadwater Road, Welwyn Garden City, Herts.
NEGRETTI AND ZAMBRA, LTD., 122 Regent Street, London, W.1.
THE PLESSEY CO., LTD., Vicarage Lane, Ilford, Essex.
PYE, LTD., Cambridge.
RACAL ENGINEERING, LTD., Western Avenue, Bracknell, Berks.
REDIFON, LTD., Broomhill Road, London, S.W.18.
SHORT AND MASON, LTD., 280 Wood Street, London, E.17.
SIMON EQUIPMENT, LTD., 48 George Street, Portman Square, London, W.1.
STANDARD TELEPHONES AND CABLES, LTD., Connaught House, 63 Aldwych, London, W.C.2.
STRATTON AND CO., LTD., Eddystone Works, Alvechurch Road, West Heath, Birmingham.
THERMIONIC PRODUCTS (ELECTRONICS), LTD., Shore Road, Hythe, Southampton.
ULTRA ELECTRONICS, LTD., Western Avenue, London, W.3.
W. S. ELECTRONICS, 44 Brunel Road, London, W.3.

APRON EQUIPMENT: ***Aircraft Towing and Starting***

AERO MAINTENANCE EQUIPMENT, LTD., 47 Victoria Street, London, S.W.1.
AIRCRAFT GROUND EQUIPMENT, LTD., Blackswarth Road, Bristol, 5.
ASSOCIATED ELECTRICAL INDUSTRIES (RUGBY), LTD., Rugby.
ATLAS COPCO (GREAT BRITAIN), LTD., Maylands Avenue, Hemel Hempstead, Herts.
AUTO DIESELS, LTD., Braby House, Smithfield Street, London, E.C.1.
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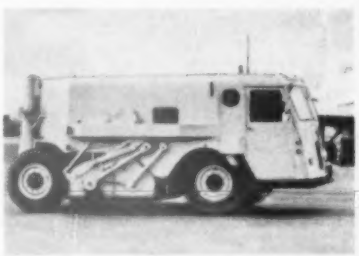

A well-known Zwicky product, this runway and apron sweeper is in use at airports all over the World.

A Conveyancer fork-lift truck loading a B.E.A. Viscount.

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DOUGLAS EQUIPMENT, LTD., Tewkesbury Road, Cheltenham.
HOUCHIN, LTD., Garford Works, Chart Road, Ashford, Kent.
I.V. PRESSURE CONTROLLERS, LTD., Atlas House, 683 London Road, Isleworth, Middx.
LANSING BAGNALL, LTD., Basingstoke, Hants.
MERCURY TRUCK AND TRACTOR CO., LTD., The Quay, Gloucester.
MUREX WELDING PROCESSES, LTD., Waltham Cross, Herts.
PARTRIDGE, WILSON AND CO., LTD., Davenset Electrical Works, Evington Valley Road, Leics.
PETBOW, LTD., Sandwich, Kent.
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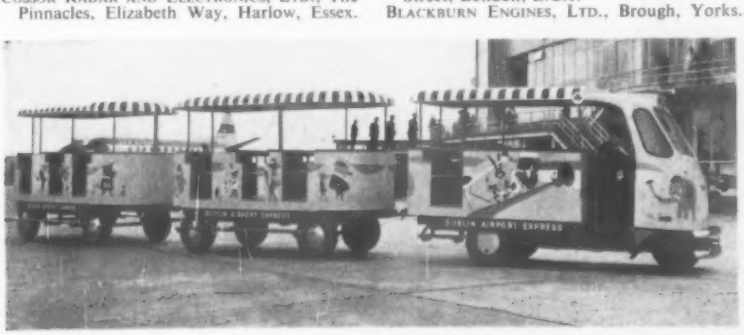
S. GRAHAME ROSS, LTD., Quarry Lane, Whyke, Chichester, Sussex.
ROVER GAS TURBINES, LTD., New Meteor Works, Lode Lane, Solihull, Warwickshire.
UNIVERSAL POWER DRIVES, LTD., Aintree Road, Perivale, Greenford, Middx.



This special "Tour Train" at Dublin Airport is based on a diesel-engined prime mover by Wales and Edwards, part of the Kenning Motor Group.

Airport Installations . . . .

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WALES AND EDWARDS, Wyle Cop, Shrewsbury, Shropshire.
WESTINGHOUSE BRAKE AND SIGNAL CO., LTD., 82 York Way, London, N.1.
WILLIAMS AND JAMES (ENGINEERS), LTD., Chequers Bridge, Gloucester.

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AERO CONTROLS, LTD., Industrial Estate, Weedon Road, Northampton.
AVERY-HARDOLL, LTD., Oakcroft Road, Chessington, Surrey.
DEXION, LTD., Maygrove Road, Kilburn, London, N.W.6.
DRAGONAIR, LTD., Fitzherbert Road, Farlington, Portsmouth.
EXACTOR, LTD., Church Way, Edgware, Middx.
FLIGHT REFUELLING, LTD., Tarrant Rushton Airfield, Blandford, Dorset.
SIR GEORGE GODFREY AND PARTNERS, LTD., Hampton Road West, Hanworth, Middx.
THOS. P. HEADLAND, LTD., 10 Melon Road, London, S.E.15.
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A. T. JUNIPER, LTD., Mapledale Works, Mapledale Road, Liverpool, 18.
LAKE AND ELLIOT, LTD., Braintree, Essex.
MERCURY AIRFIELD EQUIPMENT, LTD., The Quay, Gloucester.
M.L. AVIATION CO., LTD., White Waltham, Berks.
RELLUMIT (LONDON), LTD., Chandos House, Palmer Street, London, S.W.1.
SARO (ANGLESEY), LTD., Beaumaris, Anglesey.
SIMON ENGINEERING (MIDLANDS), LTD., Queens Cross, Dudley, Worcs.
SKYHI, LTD., Skyhi Works, Worton Road, Isleworth, Middx.
STANHAY (ASHFORD), LTD., Elwick Works, Ashford, Kent.
THE STEEL BARREL CO., LTD., Uxbridge, Middx.
STREAM-LINE FILTERS, LTD., Henley Park, Normandy, nr. Guildford, Surrey.
TECALEMIT, LTD., Plymouth, Devon.
TEMPLEWOOD HAWKSLEY, LTD., 2 Buckingham Avenue, Slough, Bucks.
THOMPSON BROS. (BILSTON), LTD., Bradley Engineering Works, Bilston, Staffs.
TRURO ENGINE WORKS, LTD., Morden Road, South Wimbledon, London, S.W.19.
WAYNE TANK AND PUMP CO., LTD., Western Road, Bracknell, Berks.
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AIRTECH, LTD., Aylesbury (Thame) Airport, Haddenham, Bucks.
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, LTD., Baginton, nr. Coventry.
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H. W. EDGHILL AND CO., LTD., Odiham Road, Hook, nr. Basingstoke.
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HESTON AIRCRAFT AND ASSOCIATED ENGINEERS, LTD., Heston Airport, Hounslow, Middx.
I.T.D., LTD., Webb Lane, Hall Green, Birmingham.
KING AIRCRAFT CORPORATION, Cameron Street, Hillington, Glasgow, S.W.2.
LISTER GROUP, Dursley, Gloucestershire.
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C. F. TAYLOR (METAL WORKERS), LTD., Wokingham, Berks.
TYNE TRUCK AND TROLLEY CO., LTD., First Avenue, Team Valley Estate, Gateshead-on-Tyne, 11.
WATFORD ELECTRICAL AND MANUFACTURING CO., LTD., Whippendell Road, Watford, Herts.
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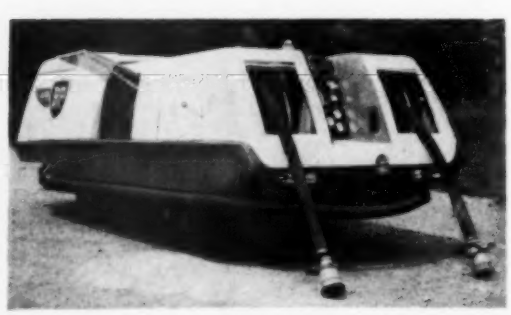
GEORGE ANGUS AND CO., LTD., Angus House, Newcastle upon Tyne.

A Lister industrial loader in use with a B.E.A. Viscount at Belfast.



The Rellumit Commando hydrant dispenser, developed for Air BP can refuel at up to 600 g.p.m.

The Gloster Miles Sweeper, part of the range of airfield equipment now manufactured by Gloster Aircraft Ltd.

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THE BRITISH ROTARY SNOWPLOUGH CO., LTD., 271 Uxbridge Road, London, W.12.
J. BROCKHOUSE AND CO., LTD., Victoria Works, Hill Top, West Bromwich, Staffs.
COVENTRY CLIMAX ENGINES, LTD., Widdrington Road, Coventry.
CULLUM DETUNERS, LTD., The Acoustic Centre, 58 Highgate West Hill, London, N.6.
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GENERAL FIRE APPLIANCE CO., LTD., St. Florian House, George Street, Croydon, Surrey.
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LEWIN ROAD SWEEPERS, LTD., Victoria Works, Hill Top, West Bromwich, Staffs.
MERRYWEATHER AND SONS, LTD., Greenwich High Road, London, S.E.10.
THE MODULAR CONCRETE CO., LTD., Staines Road, Bedfont, Feltham, Middx.
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THE PYRENE CO., LTD., Great West Road, Brentford, Middx.
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THE SUN ENGINEERING (RICHMOND), LTD., 45–49 Cambridge Road, Kingston-on-Thames, Surrey.
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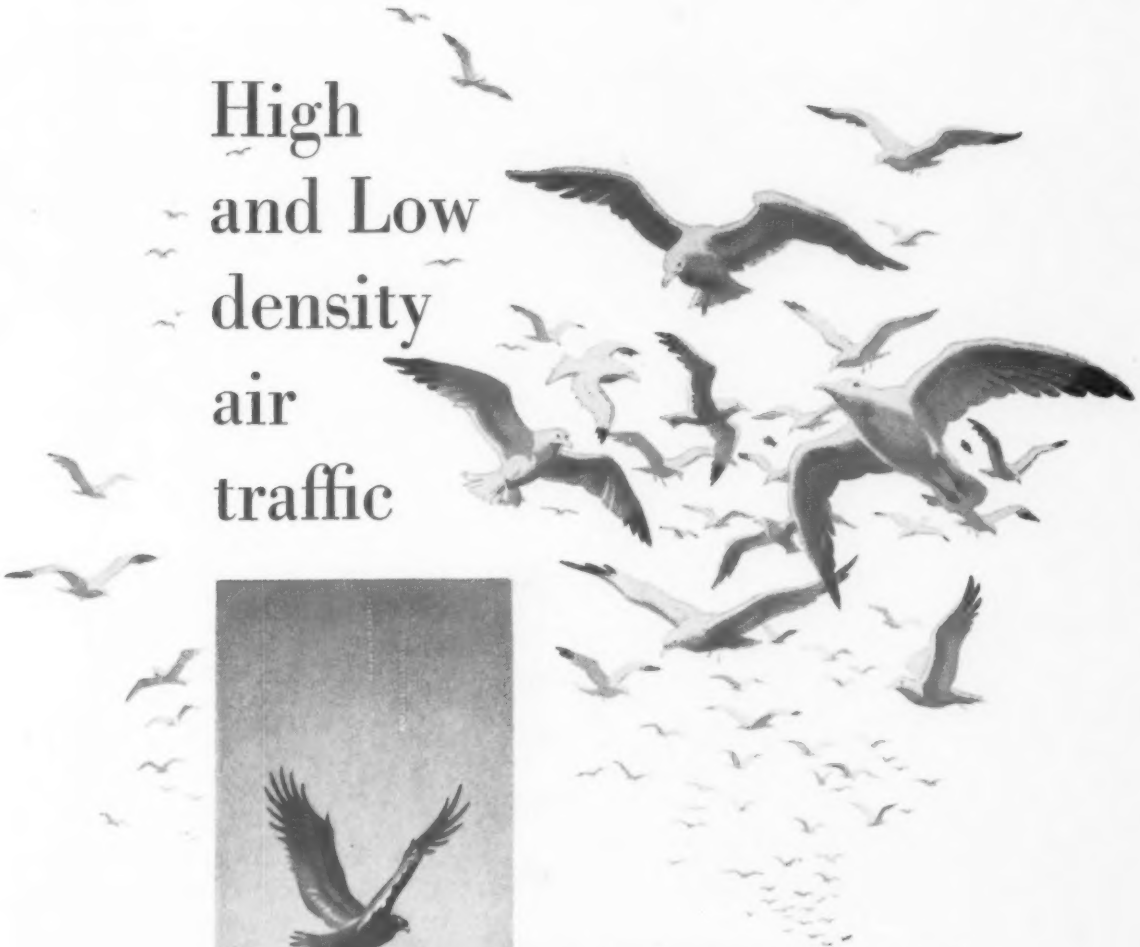
High and Low density air traffic



MARCONI AD 210C AUTOMATIC VHF DIRECTION FINDER

IN HIGH DENSITY TRAFFIC AREAS

VHF DF is finding a growing application at busy terminal areas, such as London and Orly, for use in conjunction with radar as a simple and effective means of aircraft identification in crowded airspace. It is also proving to be an invaluable aid for airways monitoring.

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The most useful single, all weather, ground navigational aid providing air traffic control facilities at low cost and requiring no special equipment to be fitted in aircraft, apart from the basic VHF communication equipment. Easy to operate and maintain with local technical staff.

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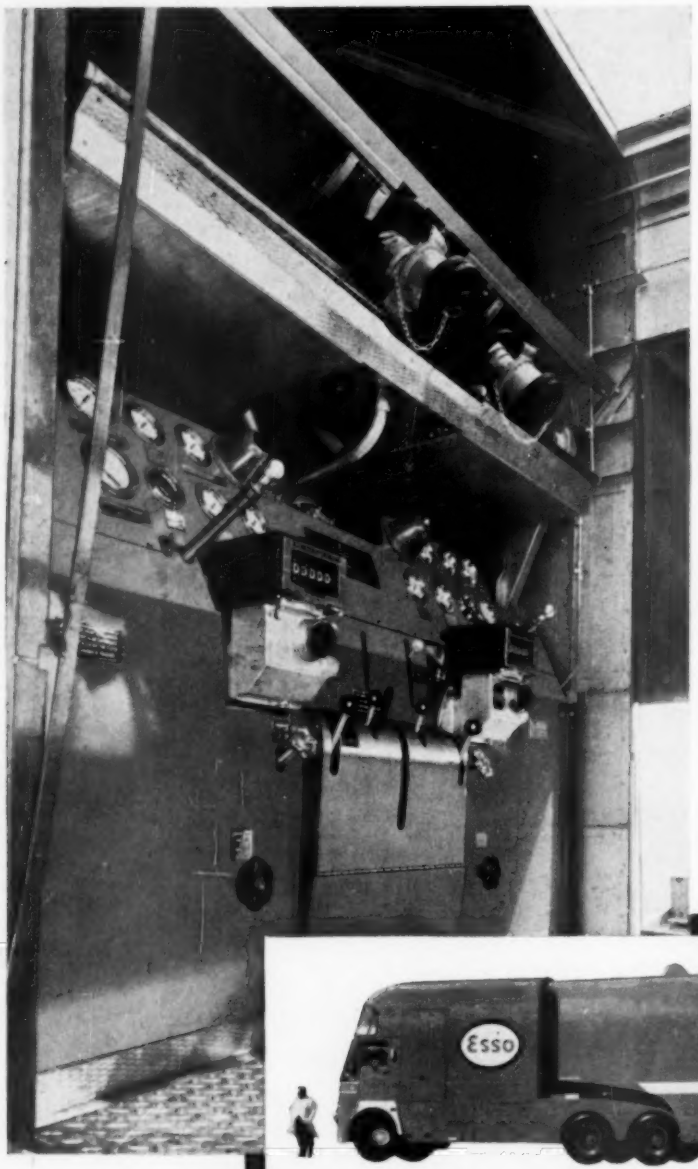

Faster Fuelling for Modern Airliners

Large modern airliners such as the Boeing 707 and the DC-8 have fuel capacities approaching 20,000 Imperial gallons. In order to maintain a quick turn-round at airports with such aircraft, a new range of superfuellers with capacities of 10,000 gallons or more has been developed. Avery-Hardoll equipment chosen for these superfuellers includes Bulkmeters, Slow-Close Valves, Automatic Bottom Loading Equipment and Self-Sealing Couplings.

The "Python" 12,000 gallon fueller illustrated here is built by the Steel Barrel Co. Ltd. for the Esso Petroleum Co. Ltd. and employs Avery-Hardoll Bulkmeters of 650 I.G.P.M. capacity. The Hose Units, Couplings and Automatic Bottom Loading Equipment (for loading at 1000 I.G.P.M.) are also by Avery-Hardoll.

Avery-Hardoll equipment has also been chosen for the "Severn" fueller, built by Zwicky Ltd. for Shell-Mex and B.P. Ltd. and for the "Yorkshire" fueller built by Saunders Roe (Anglesey) Ltd. for British Petroleum Ltd. Both these units have a capacity of 10,000 Imperial gallons.

Avery-Hardoll

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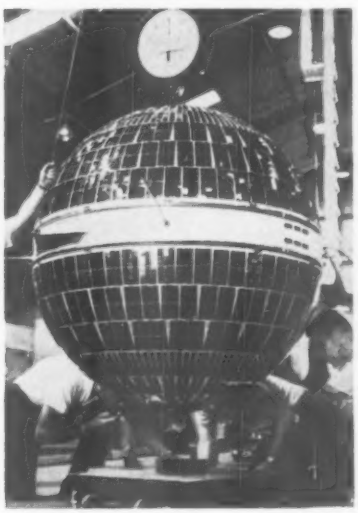
Aviation News in General

B-58 SCORE.—The highest pair of radar bombing scores and the best individual high-level navigation run in the recent 1960 U.S.A.F. Strategic Air Command Combat Competition was obtained by a B-58 Hustler crew. In operational service for only six weeks at the start of the competition, the B-58 obtained an overall score of 1,046 pt.—only 137 pt. behind the winning (B-52) aircraft.

FINAL SHOW.—Last Sunday the No. 111 Squadron aerobatic team gave its final public display at the International Aeronautical Festival at Barcelona. Its last show in the U.K. was at Wattisham on Sept. 17.

U.S. DEFENCE.—At least four Air National Guard squadrons in the United States are now equipped with Convair F-102s.

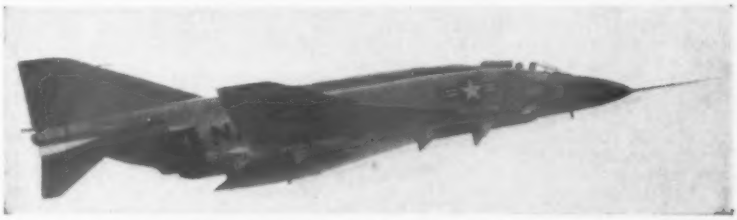
ITALIAN VTOL.—The Fiat company has in hand another project beyond the STOL G.95 fighter now definitely cancelled. The new fighter, with VTOL characteristics, should have complete support from the Italian Air Force. The Italian Air Force is also interested in STOL transport and a few designs have been submitted recently by Aerfer and Aermacchi.



FAST TALKER.—Close-up of the 500 lb. Courier communications satellite successfully placed in orbit by a Thor Able Star two-stage rocket launched from Cape Canaveral on Oct. 4. It can receive and transmit 340,000 words in a single pass over a ground station (see also page 542). Apogee 752 n. miles, perigee 602 n. miles, period 106.9 min.

RED EXPORT SUCCESS.—India is reported to be planning the purchase of Russian Mi-4 helicopters for use along its northern borders; U.S. equipment, favoured technically, is said to be too expensive. Unspecified transport aircraft may also be purchased from the U.S.S.R.

TURBOPROP CONTRACT.—Allison Division of General Motors Corporation has received a $25,153,000 contract from the Air Materiel Command Aeronautical Systems Center at Wright-Patterson Air Force Base for turboprop engines. The contract covers T56-A-7 engines for U.S.A.F. Lockheed C-130s and T56-A10W engines for the U.S.N.'s Lockheed P3V-1s.



CLOSED CIRCUIT RECORD.—The U.S. Navy has submitted to the F.A.I. for homologation the performance of a McDonnell F4H-1 Phantom II which averaged 1,390.21 m.p.h. over a 100 km. closed circuit on Sept. 25. The pilot was Cdr. John F. Davis and the performance betters by nearly 100 m.p.h. that of a Russian T-405 jet fighter on May 28 last.

DOPPLER TRIALS.—A Lockheed C-130 has been fitted with Canadian Marconi Doppler navigation equipment for trials by the U.S.A.F. Latest airline order for the equipment is from Air France, for its fleet of Boeing 707s.

POWERPLANT COLLABORATION.—Talks are under way between Piaggio and Turboméca with a view to producing French turbines in Italy.

PRODUCTION INCOME. — Italy's probable share of the European F-104 production is now evaluated at more than 100 billions of lire. This does not include electronic equipment to be bought from foreign industries.

POLISH NEWCOMERS.—Two new Polish aircraft were seen in public at an air display at Lodz on Sept. 11. One, the TS-11 Iskra, is a jet trainer intended to serve the Polish Air Force from 1962. It resembles the Temco Pinto in layout and is powered by a 1,300 lb.s.t. turbojet of Polish origin. The other newcomer was the S-2 five-seat helicopter, developed from the Russian-designed and Polish-built SM-1.

PARIS 1961.—The Paris International Air Show at Le Bourget next year will begin on May 26 and will end with flying displays on Jne. 3 and 4.

IATA TECHNICAL.—April 17, 1961, is the date on which the 14th Technical Conference of IATA will begin—in Montreal. The first week will be devoted to a supersonic symposium; other items for discussion will include communications and meteorological problems.

MOUNTAIN SOARING.—Dr. Brenig James, the organizer of the Soaring Expedition to the Himalayas, reports that permission has been received from Nepal to make an attempt next year.

SATURN PROGRAMME.—According to NASA, there will be a total of 10 R and D Saturns. First three will have live first stages and dummy upper stages and the next three live first and second stages, a dummy third stage and a payload replica. Last four will have all live stages. Initial launching is expected next year from Cape Canaveral with first operational flight—all active stages—probably in 1964.

UP AND DOWN?—Denying reports that Russia had sent a man 60 to 280 miles into space in a ballistic rocket, academician N. Sisakain, writing in *Izvestia*, said that flights of such distances "could give no tangible scientific information about the conditions for manned cosmic flights."

MARS PROBE.—Speaking of Soviet achievements in space research on Oct. 4, third anniversary of the first sputnik, Prof. A. Blagonravov said the period marked "tremendous success in rocket building and the completion of the most important stage in preparing man for space flight." Of interplanetary research, he said "it might be desirable to launch automatic rockets, similar to that which photographed the Moon, into the neighbourhood of Venus and Mars."

COMMONWEALTH SPACEFLIGHT.—Technical proceedings of the first Commonwealth Spaceflight Symposium are being published under the title, "Spaceflight Technology," by Academic Press, Inc., 385 pp., at 96s.

The meeting was organized by the British Interplanetary Society in London last year. The volume is edited by K. W. Gatland and J. E. Allen.

SCOUTING AROUND.—A Chance Vought Scout gets off to a good start in a pre-orbital firing from Wallops Island, Virginia, on Oct. 4 (see page 542). A similar four-stage, all-solid, rocket is scheduled to put the first British-built satellite instruments in orbit towards the end of next year.

Commercial Aviation Affairs

V.G.P.I. ADOPTED.—The F.A.A. last week adopted the British visual glide path indicator as a national standard (see our issue for Jly. 15). Safety and noise reductions were given as reasons for the choice.

FOKKER ORDER. — The West German charter company Lufttransport Unternehmen G.m.b.H., of Dusseldorf, has ordered one Fokker F.27, with an option on a second. This F.27, for delivery next year, will be in the "combiplane" version with a freight-loading door and convertible interior.

MORE 720s.—Eastern Air Lines is reported to have increased its order for Boeing 720s from 10 to 15, bringing the total of Boeing 707 and 720 orders to 250.

IL-18s BACK.—Ilyushin Il-18s have now resumed operation on the domestic and international routes of Aeroflot and other Eastern European airlines. They had been grounded following a crash (see our issue for Sept. 2). According to Mr. Quesada, who recently visited Russia, the Il-18 has suffered seriously from fuel injection failures, leading to burnt-out combustion chambers.

MORE CARAVELLES.—Sabena has increased its order for Caravelles VIs from four to six. Deliveries are expected to begin in January, 1961, and to be completed by June.

P.A.S. BOEING.—From Nov. 1, Persian Air Services will operate a weekly service from Brussels to Geneva and Teheran by Boeing 707 on charter from Sabena. The service supplements the twice-weekly DC-7C service from London to Teheran by P.A.S. (see our issue for Jly. 22).

BAGINTON RUNWAY.—The new runway at Baginton is to be opened tomorrow (Oct. 15) by Lord Brabazon of Tara. It is the first stage in the Coventry City Council plan to modernize the airport.

JULY MOVEMENTS.—Air transport movements at U.K. aerodromes in July increased by 15% over the July, 1959, figure, to 54,727. Larger aircraft and higher load factors kept the increase to this value despite a 33% jump in the number of passengers handled, and a 25% increase in freight set down and picked up.

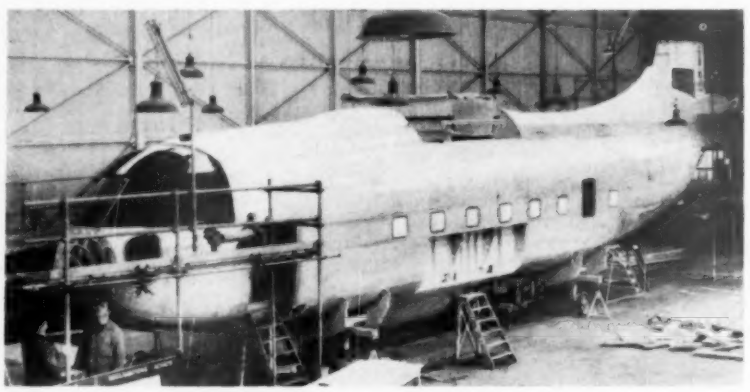
RIDDLE BUYS DC-7Cs.—Purchase of seven Douglas DC-7Cs by Riddle Airlines marks a further stage in the company's return to a sound operational basis. After modifications by Douglas to a convertible passenger-cargo interior, they will be used to improve Riddle's freight services, to develop overseas passenger charters and to participate in MATS overseas airlift contracts. The DC-7Cs, which are additional to seven Argosies ordered for Riddle's MATS Logair contract, are "trade-ins" purchased from General Dynamics Corp.

ARGENTINE RE-EQUIPMENT.—According to a recent statement by Dr. Ricardo Monfarrell, vice-president of Aerolineas Argentinas, two Caravelles are to be purchased to supplement the Comets on international routes, and close consideration is being given to the purchase of 10-12 Dart Heralds for domestic use.

CIVIL FACILITIES.—A special law is to be prepared by the Italian Defence Minister for financing facilities work for civil aviation. The sum disposable is evaluated at about 40 billion lire.

TWO LUCKY ESCAPES. — Two potentially disastrous incidents involving airliners last week-end caused no more than superficial injuries to a few passengers, although the aircraft were badly damaged in both cases. On Oct. 7, an Air France Boeing 707 made a wheels-up landing at Pointe a Pitre airport, Guadeloupe, for reasons at present unknown. On Oct. 9 a Hermes 4 operated by Falcon Airways overran the airfield after a reported brake failure when landing at Southend Airport with 71 passengers from Majorca. It came to rest with the nose on the main London-Southend electric railway.

EASTERN'S ELECTRA LOSS.—Eleven of the 72 occupants of an Eastern Air Lines Electra survived when the aircraft plunged into Boston harbour immediately after take-off from Logan Airport on Oct. 4. The survivors, all seriously injured, included the two stewardesses but not, as at first reported, the two pilots. The accident was the fifth to an Electra in 22 months of service, but there was no immediate evidence to associate this accident with the earlier ones. Mr. Quesada, administrator of the F.A.A., said there was reason to suspect the Electra had flown into a flock of starlings and may have suffered engine failure as a result.



INTEGRAL FUSELAGE.—Taking shape at Vélizy-Villacoublay is the prototype Breguet 941 STOL transport, expected to fly next April. To be powered by four Turboméca Turmo IIID turboprops, the Integral will seat up to 50 passengers. The similar Br. 942 will have a pressurized, circular section fuselage.

News About People

B.E.A. DIRECTOR.—Mr. Beverley S. Shenstone, who has been chief engineer of B.E.A. since 1948, has been appointed to the board of the Corporation.

AVRO APPOINTMENTS.—Mr. J. R. Ewans, formerly executive director and chief designer of A. V. Roe and Co., Ltd., has been appointed director and chief engineer of the company's aircraft division. Mr. A. Sewart (assistant general manager—missiles) and Mr. R. H. Francis (chief engineer, weapons research division), both formerly executive directors, now become full directors of the company. Mr. H. Dobson, formerly works manager, becomes an Avro director and deputy works director. He is succeeded as works manager by Mr. W. J. D. Wilson, formerly general works manager with Hawker Aircraft.

JOINING THE BOARD.—Air Marshal Sir Geoffrey Tuttle, K.B.E., C.B., D.F.C., has been appointed an additional member of the board of Vickers-Armstrongs (Aircraft), Ltd.

BOOTH APPOINTMENT.—Mr. A. W. Williams, B.Sc., A.I.M., has been appointed chief technical representative in charge of the technical sales service department of James Booth Aluminium, Ltd. Mr. Williams joined the former James Booth and Co., Ltd., in 1939.

RESEARCH COUNCILLORS.—Prof. B. Bleaney, F.R.S., and Dr. James Cook, F.R.S., have been appointed members of the Council for Scientific and Industrial Research. Together with a third member yet to be appointed, they succeed Prof. P. M. S. Blackett, F.R.S., Sir Eric Ashby and Mr. H. Douglass, who have retired.

FAIRCHILD CHANGE. — Mr. James H. Carmichael has resigned the presidency of Fairchild Engine and Airplane Corp. The company chairman, Mr. Sherman T. Fairchild, is acting temporarily as chief executive officer, pending appointment of a new president.

ALUMINIUM APPOINTMENT. — Mr. J. C. Reed, formerly sales engineer of Birmingham Aluminium Casting (1903) Co., Ltd., the light-alloy founders, has been appointed sales manager.

MR. I. S. JEHU.—We regret to record the sudden death in London last week of Mr. Ivor Jehu at the age of 51. Since 1952 he had been chief information officer at the M.o.S. and the M.o.A.

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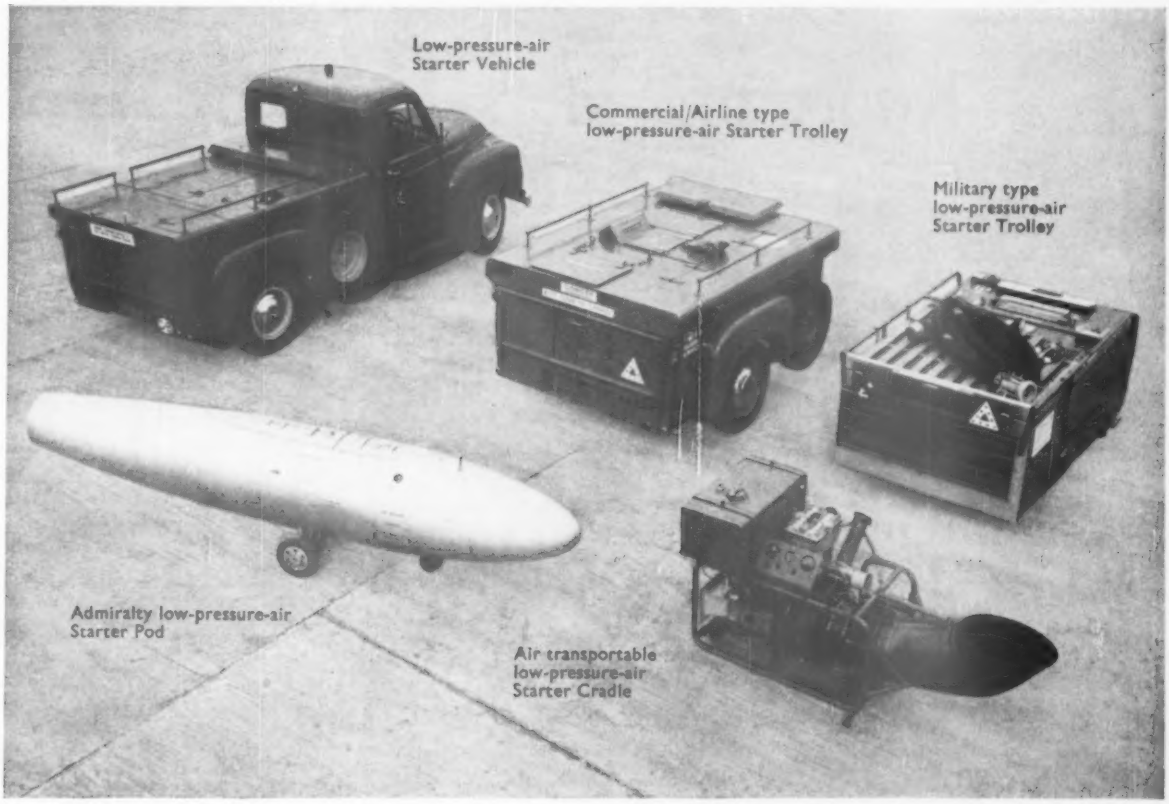
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The Fighting Services

Global Tour

ON Oct. 1 the A.O.C.-in-C., Transport Command, Air Marshal Sir Denis Barnett, started a round-the-world tour of inspection. Flying in a Comet 2 of No. 216 Squadron (Wg. Cdr. R. G. Churcher), he will be away for 27 days and is expected to cover some 27,000 miles in a flying time of 75 hours.

Inspecting Service routes and staging facilities, and liaising with overseas commands and Commonwealth Air Forces, the A.O.C.-in-C. is stopping at El Adem, Entebbe, Nairobi, Aden, Gan, Singapore, Darwin, Canberra, Wellington, Ohakea, Nandi (Fiji), Christmas Island and Goose Bay.

Transport Command

AIR COMMODORE E. D. McK. NELSON, C.B., Commandant of the R.A.F. College, Andover, since April, 1958, is to become Air Officer in charge of Administration at Headquarters, Transport Command, on Oct. 17.

Appointed Group Captain in charge of Operations at Bomber Command in 1949, he later commanded R.A.F. Benson and became Assistant Commandant of the R.A.F. College, Cranwell, in 1952. On the directing staff of the R.A.F. Staff College, Bracknell, from 1954 to 1956, Air Cdre. Nelson was previously Commandant of No. 1 School of Technical Training at Halton.

New Squadron Formed

THE Valetta element of No. 84 Squadron, until recently a mixed Beverley and Valetta unit at R.A.F. Khormaksar, Aden, has been given full squadron status, and from now on will be known as No. 233 Squadron.

This decision by Headquarters, Air Forces Arabian Peninsula, to form a separate Valetta squadron at R.A.F. Khormaksar was taken with a view to simplifying the administrative arrangements of No. 84 operating two different types of aircraft. The change in no way affects the rôle of No. 84 Squadron which is now equipped exclusively with Beverleys.

Five Valettas have been operating in the Arabian Peninsula for the past 10 years and although their rôle is primarily one of transport and communications, they also undertake supply drops to ground forces in different parts of the Arabian Peninsula Command. In an average month they carry 650 passengers and 360,000 lb. of freight on routes extending from Bahrein in the north to Eastleigh, Kenya, in the west.

Originally formed at Dover in 1918 from three seaplane flights, No. 233 Squadron undertook reconnaissance and anti-submarine patrols and made attacks on enemy shipping with Coastal Command during the Second World War. In 1940 its Hudson aircraft, working closely with the destroyer "Cossack," helped to capture the "Altmark," while a few months later they undertook a series of attacks on the pocket battleship "Scharnhorst."

Still equipped with Hudsons, No. 233 was engaged on anti-submarine patrols at Gibraltar from 1941 to 1944. It was then transferred to the 2nd Tactical Air Force, and later to the Far East in an air support rôle with Dakotas before being finally disbanded in December, 1945.

Anti-Submarine Training

DURING the recent NATO exercises in the Atlantic and North Sea, Coastal Command Shackletons flew 135 sorties and logged over 1,500 hours in support of both the strike fleet "Fallex 60" and the "enemy" forces. Apart from operating from their main bases at St. Mawgan, Ballykelly, Kinloss and Gibraltar, some aircraft were temporarily detached to Valkenberg, Holland, and others extended their range by refuelling at airfields in Northern Norway.

Facing one of its stiffest tasks in any exercise, the Command enjoyed a high degree of aircraft serviceability. In addition to the Shackletons, its Hastings totalled 225 hours on weather flights.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. R. H. Benwell, Wg. Cdr. T. A. Whiting, D.F.C., and Sqn. Ldr. J. F. Potter, D.F.C., to the Department of the Chief of the Air Staff, the last with acting rank of Wg. Cdr.; Gp. Capt. I. G. Broom, D.S.O., D.F.C., A.F.C. to the Department of the Air Member for Personnel; Wg. Cdr. H. E. Barker, O.B.E., with acting rank of Gp. Capt., and Sqn. Ldr. D. G. Beal, with acting rank of Wg. Cdr., to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. R. G. Wilson, D.F.C., A.F.C., to R.A.F., Honington to command No. 55 Squadron

Coastal Command: Wg. Cdr. J. F. Sanders to Headquarters as Command Education Officer.

Flying Training Command: Wg. Cdr. K. C. Roberts, A.F.C., to R.A.F. Topcliffe to command the Administrative Wing.

Technical Training Command: Wg. Cdr. T. L. Davies, M.B.E., to No. 12 School of Technical Training, Melksham, to command, with acting rank of Gp. Capt.

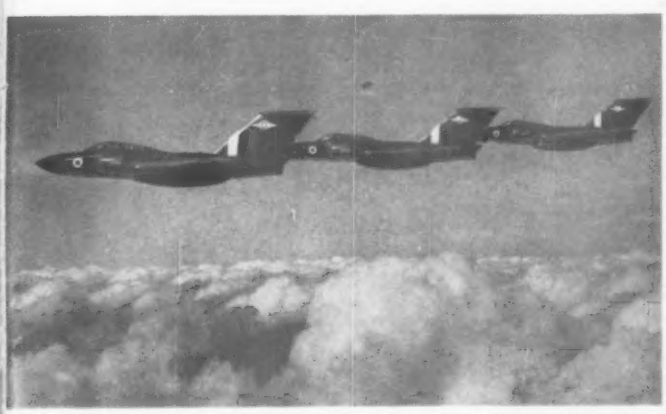
R.A.F. Germany: Wg. Cdr. H. C. Randall, D.F.C., to R.A.F. Bruggen to command the Administrative Wing.

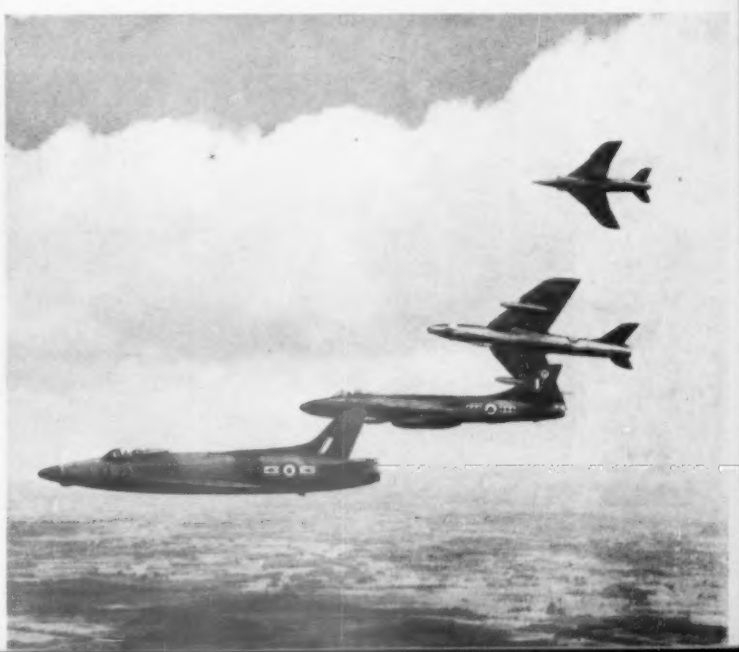
Other Appointments: Gp. Capt. P. M. Brothers, D.S.O., D.F.C., to Supreme Headquarters Allied Powers Europe as Staff Officer, Policy; Gp. Capt. C. M. Fell, A.F.C., to Allied Air Forces Central Europe as Chief of the Policy Division; Sqn. Ldr. A. T. Williams, M.A., to the Directing Staff, Royal Naval Staff College, Greenwich, with acting rank of Wg. Cdr.

More Service News

R.A.A.F.—The first course of navigators to be trained entirely at the R.A.A.F. School of Air Navigation recently graduated at East Sale.

Visiting Canada.—The Under-Secretary of State for Air, Mr. W. J. Taylor, M.P., is to visit Canada to attend the biannual meeting on Nov. 21 of the Air Cadet League of Canada. During his two weeks in Canada he will also visit R.C.A.F. units at the invitation of the Chief of the Canadian Air Staff.





OPERATING IN GERMANY.—Above, Javelin FAW.4s of No 11 Squadron (Wg. Cdr. J. G. Croshaw, A.F.C.) based at R.A.F. Geilenkirchen. Right, two Swift FR.5s of No. 79 Squadron (Sqn. Ldr. R. J. Buchanan, A.F.C.) from Gütersloh, with a Hunter F.6 of No. 14 Squadron (Sqn. Ldr. A. S. Foulkes) and another from No. 26 Squadron (Sqn. Ldr. D. L. Edmonds, A.F.C.) from the same station.

New Space Projects

SEVERAL new spacecraft for the early exploration of lunar and interplanetary space were described by Mr. Morton J. Stoller, assistant director for Satellite and Sounding Rocket Programs, NASA, when he spoke at a special meeting of the British Interplanetary Society in London on Oct. 1. The title of his lecture was "The U.S. National Aeronautics and Space Administration's Space Flight Program."

Mr. Stoller began by outlining the scope and organization of NASA which he defined as being set up to: (1) plan, direct and conduct aeronautical and space activities; (2) arrange for participation of the scientific community in planning scientific measurements and observations to be made through the use of aeronautical and space vehicles, and to conduct or arrange for the conducting of such measurements and observations; and (3) to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

On the subject of rocket launching vehicles, Mr. Stoller described the Chance Vought Scout as being an economical booster well adapted to high altitude sounding, satellite launching of relatively small payloads, and as a vehicle for use in aerodynamic testing. An all-solid, four-stage rocket, it has the ability to carry about 150 lb. into a 300 n. mile orbit.

It was, in fact, the joint Anglo-American satellite project International I, which makes use of this launching rocket, that had brought Mr. Stoller to England for discussions with Sir Harrie Massey and others concerning its instrumentation.

Of the other prospective launching vehicles, Mr. Stoller said that Thor-Agena B using the "restartable" Agena B as the upper stage was an outgrowth of the system originally developed for the U.S.A.F.'s Discoverer programme. It would be used in meteorological work and for launching heavier scientific satellites. First launching of this combination with a NASA payload is not expected until late next year.

Atlas-Agena B is the vehicle scheduled to carry the first lunar spacecraft in the Ranger series in a programme managed by the Jet Propulsion Laboratory (THE AEROPLANE AND ASTRONAUTICS, Aug. 5, 1960, pp. 166-167). It will also be used for scientific satellites and for orbiting communications satellites.

Centaur, which will use liquid oxygen and liquid hydrogen in the upper stage, will be launched for the first time next year. It is intended for lunar and planetary missions and for communications programmes which require 24-hr. orbit capability.

Saturn will be used for lunar and planetary programmes and studies are being made for its use in manned spaceflight (THE AEROPLANE AND ASTRONAUTICS, Aug. 26, 1960, pp. 236-237). Nova, on the other hand, is "relatively little more at this point than a paper study vehicle." Studies have been made on the basis of clustering six of the large Rocketdyne F-1 engines of 1,500,000 lb. s.t.

When these vehicles become available, it should be possible for the United States to increase the payload of its spacecraft considerably. In 1961, for example, Atlas-Agena B "will bring our capability up to about 5,000 lb." In 1962, Centaur should permit payloads of "up to 8,000 lb." Then the year following should see a sharper increase still when the first of the "development Saturns" should make possible consideration of payloads in the range of 20,000 lb.; as the full potential of Saturn is developed, "the carrying capacity should grow to over 50,000 lb."

A second way to review the vehicle situation, Mr. Stoller said, is to see what mission compatibility will exist with these booster systems. As regards the 300-mile Earth orbit, the payload requirements for geophysics and meteorology are such that the Thor-Agena B "will probably fill almost all our needs, while the Scout will be able to handle certain small, special purpose, payloads." Atlas-Agena B and Centaur will provide sufficient capacity for such projects as the Orbiting Astronomical Observatory.

If we now consider moderate vehicle capabilities for the escape trajectory, "we see that the Atlas-Agena B is required to carry out lunar rough landings and to put a reasonably large geophysical payload in a highly eccentric orbit." Planetary fly-bys and soft lunar landings are within the capabilities of Centaur, but planetary orbiters require a heavier payload capability than is possible with this booster.

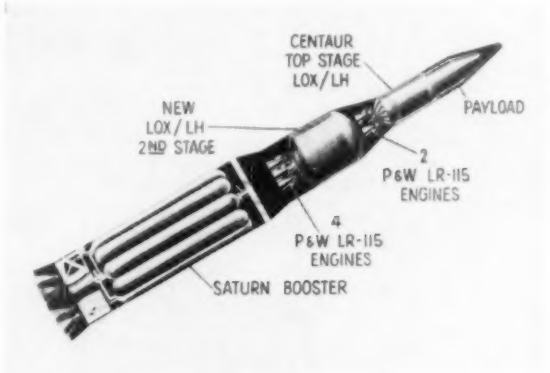
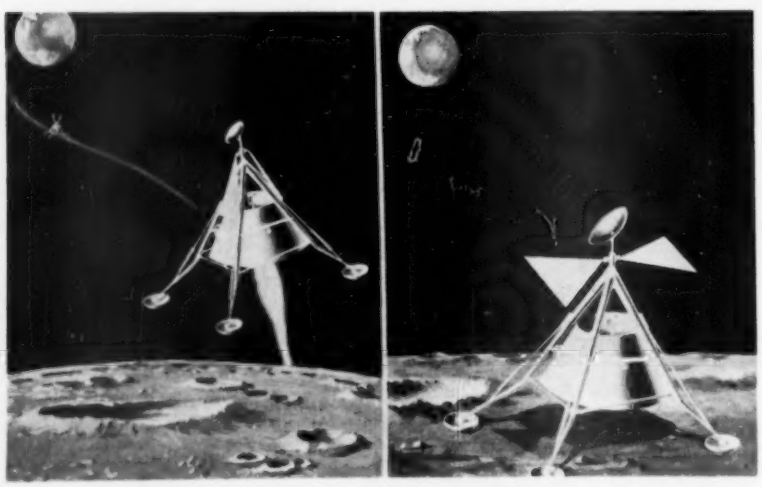


Diagram of the Saturn C-1 space-booster.

New Satellites

With the exception of the first Vanguard satellite, which has been the subject of a number of studies resulting in new discoveries in geodesy and the nature of the upper atmosphere, Mr. Stoller said that the only scientific satellite which was still transmitting data on Oct. 1 was Explorer VII. This satellite actually "brought together" all those experiments which had not been successfully flown during the period of the International Geophysical Year. With its successful launching in October, 1959, all the IGY satellite experiments finally reached orbit. A time switch had been installed in this satellite designed to switch off its radio telemeter "after a nominal period of one year" to prevent its transmissions



Artist's impressions of the Surveyor-type probe which, launched by a Centaur booster, should be capable of soft-landing between 100 and 300 lb. of scientific equipment on the Moon. Vehicle will be equipped with a retro-rocket, two-way radio communication, and extensible solar panels for power supply.

"continually cluttering up the radio frequency channels."

The speaker said that some difficulties had been experienced with Explorer VII as one of the transistors had started to shift its characteristics with temperature. As the satellite encountered greater or lesser periods of darkness, the resultant temperature variations resulted in one of the telemetry channels failing to function properly and in recent weeks trouble had been experienced with the telemetry transmitter. In the main, however, it had been possible to recover data successfully and consistently from the thermal radiation experiment, the Geiger counters and the ion chamber unit.

A number of satellites following the same general design philosophy as Explorer VII will be launched in the next few years. They will be relatively lightweight, between 80 and 300 lb., covering such experimental areas as gamma-ray astronomy, direct measurements of the ionosphere, propagation measurements through the ionosphere, measurement of the radiation belts, and measurement of the atmospheric structure.

Most complex of the new satellites is the Orbiting Solar Observatory. It consists of three basic units—a large lower unit in the form of a "wheel," an arm and a solar panel. The arm and the solar panel are mounted on the axle of the wheel structure.

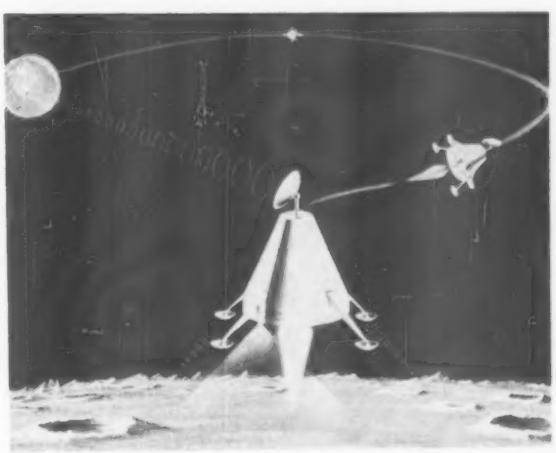
It is intended that the wheel should rotate continuously, providing the satellite with gyroscopic stability. A pointing device is incorporated to rotate the satellite to such a position that the plane of the wheel cuts through the Sun. The arm is then allowed to rotate on the axle until it points at the Sun. Mounted at right-angles to the arm, the solar panel is thereby made to face the Sun and is in a position to recharge the storage batteries within the wheel.

In the first version of this satellite the arm will contain two solar ultraviolet spectrographs, and the wheel a number of experiments in solar physics and geophysics which do not need solar pointing capability.

Should the system tend to drift off the solar disc, optical pointing detectors will cause a set of gas jets at the top of the solar panel to operate; these are fed from a gas bottle in the hub of the wheel. By pulsing these jets, it is possible to precess the wheel and arm back into solar alignment. A fine pointing control for the arm is also provided.

Mr. Stoller said it was hoped to use the basic structure of the observatory, including its pointing controls and dual telemetry, several times in the course of the next few years in different experiments. In these respects, the satellite programme is being directed in a manner similar to that of the launching vehicle programme; that is, NASA is attempting to reduce the number and varieties of shape and size of satellites. "We believe that we can re-utilize a given spacecraft a number of times before undertaking a major re-design. We expect that this will save a great deal of engineering effort as well as achieving an increase in system reliability."

The logical next step is an Orbiting Geophysical Observatory. "We visualize a central body which contains the instruments, the common telemetry, the command receiving system, and all the other devices needed to adjust and report on the internal conditions of the satellite. To this are attached the large solar panels, and several extendable arms to which those experimental sensors which have to be isolated from the main body of the satellite are attached."



This drawing shows a Prospector-type spacecraft which might carry to the Moon's surface a mobile search vehicle to improve on the data supplied by the static probe Surveyor. Note that the feet of the probe are used as antennae for the radio-altimeter landing system.

TYPE	MISSION	LAUNCHING VEHICLE
RANGER	Test of basic steerable spacecraft in space with seven scientific experiments. Later, lunar rough landings of 300 lb. capsule containing protected instruments and radio transmitter.	Atlas-Agena
MARINER	Early probes to Mars and Venus (based on Ranger).	Atlas-Agena
SURVEYOR	Soft landing of 100-300 lb. on the Moon.	Centaur
PROSPECTOR	Soft landing of mobile laboratory on the Moon with search radius of 50 miles.	Saturn
VOYAGER	Probes to orbit Venus and Mars and eject into atmospheres, and possibly soft-land, instrument capsules.	Saturn

Future NASA lunar and planetary probes.

NASA expects to operate these geophysical observatories in both near-Earth, almost circular, polar orbits, and in highly eccentric orbits out to some 60,000 miles or more. Polar orbiting satellites weighing about 1,000 lb. will be launched by Thor-Agena, and those on eccentric orbits—of less weight—by Atlas-Agena. Eventually, it is expected that the Centaur booster will take over the high apogee missions with payloads of at least 1,000 lb.

An Astronomical Observatory

Last of the trio of new scientific satellites—NASA are just at the point of starting initial design work with a systems contractor—is the Orbiting Astronomical Observatory. Much more complex than the other two, it will have precise pointing control and relatively elaborate data handling devices.

Planned experiments include an ultraviolet sky mapping survey; multi-colour UV photometry of stars, low dispersion stellar UV spectroscopic studies, and absolute UV spectrophotometry of both stars and extended emission regions. A very high resolution UV spectrometer will be used to examine in detail the absorption effects of the interstellar medium. The last experiment will require extremely high precision pointing stability—"to a fraction of a second of arc."

The central core of this spacecraft will be an interchangeable instrument container which will permit several different sets of experiments to be orbited by the same basic structure. The capacity of the system will be such that a mirror up to 36-in. in diameter can be installed in the central element.

To obtain the necessary pointing accuracy, Mr. Stoller said it was proposed to "take advantage of the signals from the optics provided by the experimenter to drive the sensors which will control the direction of the optical axis of the observatory." There will be a command system and an internal storage device which will make it possible for the experimenter to load the satellite-borne memory of the programmer with instructions to point to successive stars in the course of an orbit and to store data thus collected in a separate memory. When the satellite once again reappears over the master control and telemetry station, the memory devices will "read out" to the ground receiving equipment and the programming unit will be reset for the next cycle of operation.

Lunar and Planetary Probes

Turning to lunar and interplanetary research, Mr. Stoller said that in 1962 three Ranger vehicles were planned to rough-land payloads on the surface of the Moon. These will be followed by the soft-landing mission for which the designations Surveyor and Prospector have been chosen for the spacecraft concerned. It is possible, he added, that a more complete investigation of the lunar surface characteristics by means of an advanced lunar orbiter may precede surface exploration with a mobile vehicle.

It would be expected that the instrumented lunar programme would eventually evolve into the manned programme of lunar exploration, although Mr. Stoller thought it was likely that unmanned payloads would be continued at some level for an indefinite period.

In the planetary programme, Mariner spacecraft are planned for Mars and Venus "fly-bys" at the first practical opportunity. The interplanetary environment will be studied en-route. Voyager spacecraft, using the Saturn vehicle, are being considered for advanced planetary orbiters.—K.W.G.

Minuteman Communications

A RADIO-CONTROL communications system for launching Minuteman ICBMs has been announced by the Boeing Airplane Company. Tests of the system, which employs buried antennas and so-called "earth currents," have recently been completed which show the technique to be effective in providing communications between Minuteman launch control centres and launching sites.

Major advantage of the radio communications system is its greatly reduced cost in comparison to the buried cable network originally planned for all missile squadrons placed in underground launching "silos." In addition, the new system will be very difficult to jam, destroy or sabotage in the event of enemy action. Basic elements of the system are message processing and correlating devices, signal transmitting and receiving equipment and the buried antennas. Processing equipment is being supplied to Boeing by the Sylvania Electric Company under a $7.5m. sub-contract.

U.S.A.F.'s Blue Scout

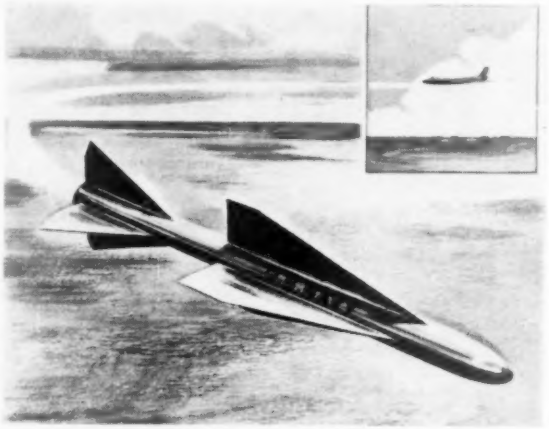
A NUMBER of special research support vehicles derived from, and closely related to, NASA's Scout all-solid "economy" rocket are being developed by the United States Air Force under the designation Test System 609A. They are for use in experiments conducted by the Air Research and Development Command into the upper atmosphere and circumterrestrial space. A three-stage version, Blue Scout I, was launched from Cape Canaveral on Sept. 21 (THE AEROPLANE AND ASTRONAUTICS, Sept. 30, 1960, p. 484). Blue Scout II will have four stages.

A special version of the four-stage vehicle will be used to test vertical and angular launch techniques, boost-glide and boost-dive trajectories and recovery techniques for the Dyna-Soar project. Investigation of temperature-resistant materials will also be made. However, there are many more research applications for these economic and versatile rocket boosters. Present schedules call for the launching of 15 Blue Scout IIs next year from the U.S.A.F. launching facility at Cape Canaveral.

The basic NASA Scout will continue to be launched from Wallops Island and is, of course, scheduled to put the first Anglo-American satellite, International I, into orbit towards the end of 1961. Forerunner of this four-stage booster was launched "with complete success" from Wallops Island on Oct. 4. No attempt was made to place a payload in orbit but instead the rocket was fired 5,800 miles down the Atlantic Missile Range. Its final stage contained 78 lb. of instruments for measuring radiation in space. Estimated maximum altitude was about 3,500 miles.

The payload capsule, weighing 122 lb. including the radiation instruments, was designed to burn up in the atmosphere after sending back its information by radio telemetry.

Cost of the launching was estimated at approximately £320,000. It is hoped to reduce this to between £180,000 and £250,000 by the time the launching programmes are in full swing.



First picture of the advanced air-to-air missile, Eagle, being developed for the U.S. Navy. Six of these long-range weapons will be carried by the Douglas Missileer which is designed for long-standing patrol at 35,000 ft. in support of naval task forces.

Orbital Courier

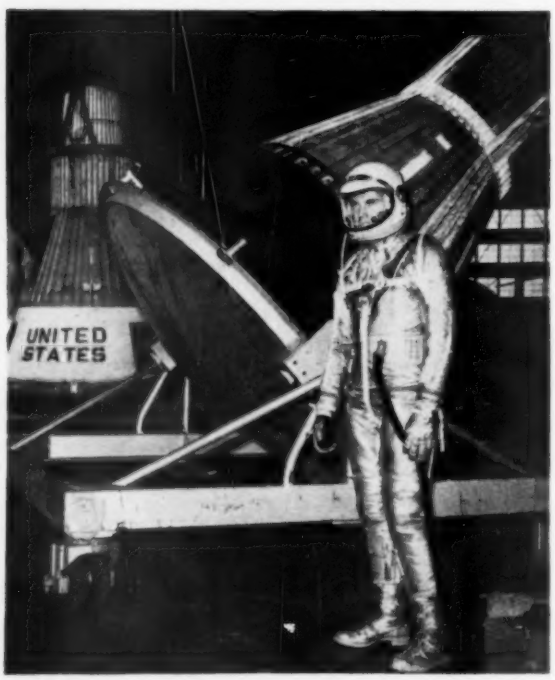
A COMMUNICATIONS satellite with the ability to memorize and transmit the entire contents of the Bible between continents in 12 minutes was successfully placed in orbit on Oct. 4. The satellite, known as Courier 1B, is equipped with five tape recorder and transceivers capable of handling 68,000 words a minute simultaneously.

Two hours after the launching, a spokesman at Cape Canaveral reported: "It is working, we are receiving, and the information is very good. Its orbit is something near what we planned." The satellite had, in fact, been designed to go into a near-circular orbit at a height of about 650 miles and as close to the Equator as possible. This would carry the vehicle as far north of the Equator as Cape Canaveral and as far south as South Africa and mid-Australia. Its only venture "behind the Iron Curtain" would be over the extreme southern tip of Communist China.

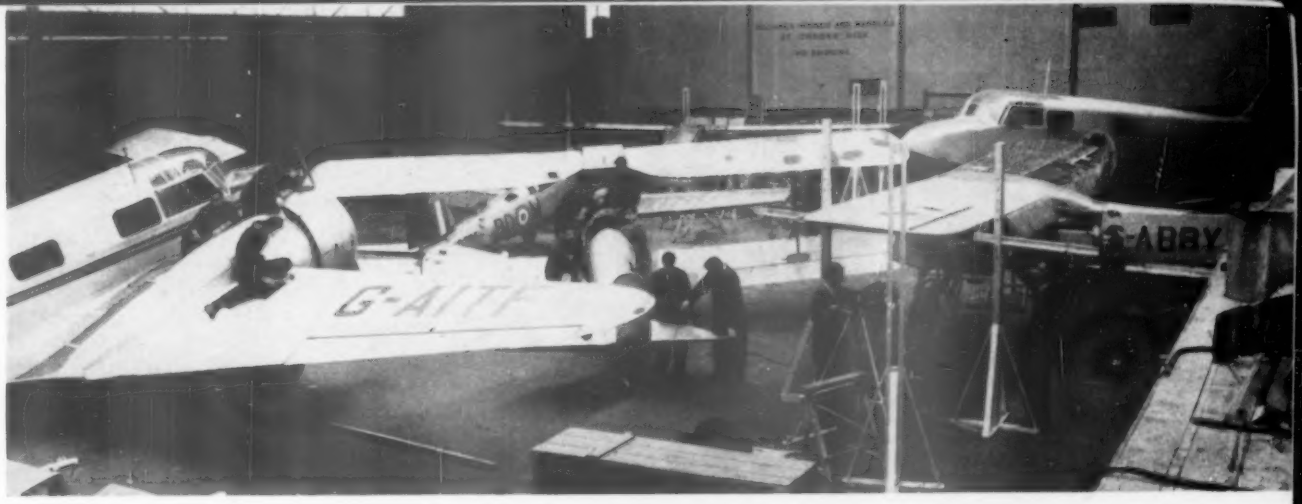
Courier takes the form of a 51-in. diameter sphere and weighs approximately 500 lb.; its surface is covered with 19,200 solar cells which are expected to keep its electronics in operation for a year. Basic function of the satellite is to receive and record high-speed radio-teleprint and voice messages from one station and relay them to another when commanded by a coded signal. The system, making use of "microwave frequencies," is regarded as being "practically unjammable."

The project is being developed as a global communications system to provide Western military forces with efficient communications free from the possibility of sabotage. Prime agent behind Courier is, in fact, the U.S. Army Signal Corps although, as might be expected, all the military services are taking a great deal of interest in the outcome of this pioneer experiment. Within three to four years, the Army hopes to have a chain of Courier satellites in orbit.

Meanwhile, the possibility of adapting the system for commercial purposes—as an adjunct of the underwater cable—is not being overlooked by American industry which is busily at work on several schemes. When the time does come for satellites to serve the purpose of civilian communication—and the day may not be too far distant—the basic work carried out with Courier under a military budget should go far to ensuring America's pre-eminence in this essentially commercial field.



Wearing an aluminiumized spacesuit, Mercury astronaut, L. Gordon Cooper, poses in front of a production capsule at NASA's Langley Field. It is planned to launch one of the seven volunteer astronauts in a Redstone-boosted capsule 200 miles downrange from Cape Canaveral "in December or January." Attempts to put a man into orbit will not be made before next midsummer.



Aeronautical Training at Perth

IN May of this year, the aircraft engineering school of Air Service Training at Hamble was acquired by Airwork Services, Ltd., and transferred to its establishment at Perth Aerodrome. There the former A.S.T. school has been amalgamated with the company's School of Aviation to form Airwork Services Training.

Recently enlarged and developed to provide accommodation for the staff and students of its new engineering facility, the original school was opened by Airwork in 1935 as a privately owned flying training establishment. A residential college, it now offers fully approved instruction in both the technical and the flying aspects of civil aviation.

For this task there is at present a teaching staff of seven flying instructors and 11 engineering instructors headed by the principal, Wg. Cdr. F. D. Nugent, A.F.C. Altogether, the company employs some 109 personnel for the running of the school, and its other commitments at Perth which include the Scottish Aero Club and the overhaul of the Chipmunks belonging to the four Scottish university air squadrons at Aberdeen, Edinburgh, Glasgow and St. Andrews.

The current total student population at Perth is 138, of whom 33 are undergoing flying instruction and the remainder are taking aircraft maintenance and repair courses. Of the 33 students on the flying side, approximately one-third are from the United Kingdom and the majority are paying their own way, although, for example, the Ghana Government is sponsoring six students. The engineering trainees on the other hand are mainly (96-97%) from overseas and sponsored by various airlines or other bodies.

Flying Courses

Although Airwork provide various flying courses, including instruction for the Private Pilot's Licence and the Senior Commercial Pilot's Licence, the main training syllabus is directed towards the Commercial Pilot's Licence. This comprises a comprehensive basic course specially formed for *ab initio* students and includes the requirements for their Radio Telephony Licence, and an advanced course for obtaining an instrument rating endorsement.

For the C.P.L. the Ministry has a normal minimum requirement of 200 hours' flying, but students completing the company's approved course may have this total reduced to 150 hours. This latter figure must include 100 hours as pilot-in-charge, 20 hours' cross-country flying, 10 hours at night and 10 hours' instrument flying. Including the necessary ground school instruction, the complete syllabus lasts for nine months and costs £1,095, plus £200-£230 for accommodation, bringing the total fee for the basic course up to approximately £1,300.

The standard A.S.T. advanced course for the instrument rating endorsement also covers twin-engine conversion and comprises approximately 80 hours, made up of 30 hours' instruction and up to 50 hours' pilot-in-charge flying to enable the student to log 150 hours in command as required by M.o.A. Link trainer instruction is also provided as part of the course which costs £810 without accommodation and lasts for two to three months.

Altogether, the complete C.P.L.-instrument rating syllabus takes a year at Perth and costs, in round figures, about £2,200. Additional flying or ground instruction is charged for on an hourly or weekly basis.

The training fleet consists of six Chipmunks, three Consuls, a Messenger, an Auster and a Prentice, to which A.S.T. is adding a Cessna 175 and two Cessna 150s. The 175 is expected this month and the two 150s are due to be delivered in December. A Cessna 310 may also be purchased at a later date.

Basic instruction and the majority of solo flying are undertaken in the Chipmunks, with the Messenger, Auster and Prentice being employed for navigational exercises. Twin conversion and general instrument flying is provided by the Consuls.

Up to the present time the average flying course has been made up of about 16 trainee pilots, so that the 33 students attending the school constitute two complete courses. Each course is divided into two sections for ground and flying instruction.

Engineering Training

The main M.o.A.-approved technical course at Perth lasts for two years and is designed to enable the *ab initio* student to qualify for the A, C and X categories of the Maintenance Engineer's Licence. This provides a saving of two years on the normal requirements which lay down a minimum of three years' engineering experience for the A and C licences, and a further year's experience to qualify for the X licence.

Divided into eight terms, alternately devoted to engines (Gipsy Major and Cheetah) and airframes (Auster, Oxford, Chipmunk and Tiger Moth), the course includes final school examinations which the student must pass before he can sit the A.R.B. examinations. The total cost of obtaining these licences is approximately £1,000, which includes £440 instructional fees, £496 for accommodation, and an initial charge at the beginning of the first year of £25.

Two other courses operated by A.S.T. cover the B and D licences. Each lasts a minimum of one year and are designed so that students who have passed the previous course, or others who hold a current A and/or C licence, can qualify for the additional licences. Each student taking these courses also receives practical training in the overhaul, modification and repair of aircraft in the engine overhaul department.

In addition to its standard instructional syllabuses, A.S.T. also undertakes a number of special courses. These include short flying conversion courses, including helicopter training, link trainer instruction and air traffic controller training. Although limited in scope at the present time, A.T.C. instruction may be expanded in the future to incorporate a six months or so course, comprising theory, synthetic and practical training.

Top, work in progress in an engineering department hangar. Practical training is given on Auster, Oxford, Chipmunk and Tiger Moth airframes. Right, a general view of the Airwork Services Training establishment at Perth. The new domestic accommodation can be seen in the foreground.

Personal Flying

SUCCESS in Australia of the Millicer Air Tourer two-seater has been firmly established with the sale of six of these aircraft to the Auckland Aero Club in New Zealand. Production of the Air Tourer, which was designed by Mr. Henry Millicer, chief aerodynamicist of the Government Aircraft Factory, Melbourne, is being undertaken by Victa Consolidated Industries at Tamworth, N.S.W., and it is the first indigenous civil aircraft built in Australia since before World War II.

Deliveries to New Zealand are scheduled to begin next March, and a further four aircraft, which will be four-seaters, are included in the overall £A56,000 contract. The Air Tourer is powered by a 95 b.h.p. Continental and cruises at 105 m.p.h., but the larger type, which is due for flight-testing in the near future, will have a bigger engine and cruise at 180 m.p.h.

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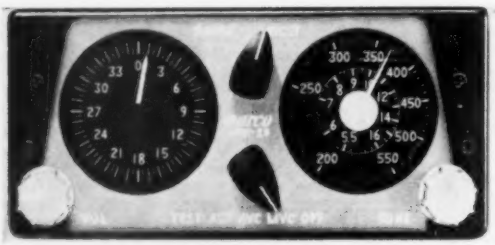
An 8 lb. transistorized ADF with only one moving part—the indicator needle—has been developed by the U.S. National Aeronautical Corporation for executive and personal aircraft. Instead of an electrically-driven rotatable loop aerial, the Narco ADF-29 makes use of three fixed loops, each at 120 degrees to the other, and sealed in a plastics fairing projecting only 2¼ inches beneath the fuselage. The sensor unit derives its directional information from the strongest, rather than the weakest signal normally used by null-seeking loops, which is said to provide greater directional sensitivity and less susceptibility to extraneous signals from static and other sources.



COTTON SPRAYER.—On its way to the Sudan for Crop Culture Ltd., and a winter cotton-spraying contract was this new Lancashire Prospector (295 b.h.p. Lycoming GO-480) seen here recently at Bembridge.

Direction information is fed directly to a panel needle which floats in a sealed oil-bath for maximum stability. The sensor and panel presentation are the only two units of the ADF-29 and no separate power supply or amplifier is required. A two-band tuning scale provides aeronautical or broadcast frequency selection from 200 kc/s. to 1,620 kc/s., and a function switch offers "test," "ADF," automatic volume control ("AVC") and manual volume control ("MVC") positions, the last mentioned being particularly useful for standard LF range orientation and approach procedures. Power requirement of the ADF-29 is only 0.54 amp., compared with the normal 3-6 amp., and its U.S. cost is quoted at an all-time low of $895.

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● A number of changes have been made in the **Herts and Essex Aero Club** at Stapleford Tawney, Essex, where Mr. A. F. Warnell has taken over from Mr. Charles Morley. Training is being extended to more modern light aircraft, and a Piper Caribbean and a Super Cub have been added to the club fleet, via Rent-a-Plane, Ltd. New arrangements are in hand for the clubhouse, catering, flying and social programmes.

Gliding Notes

by Dr. A. E. Slater

HITHERTO no glider pilot has reported experiencing the "break-off" phenomenon, which was first described only a few years ago by jet pilots flying in the stratosphere. It is a curious feeling of complete detachment from the World and its affairs, and there is some question whether it may lead the pilot to act irrationally.

Dr. Grey Walter, of the Bristol Gliding Club and the Burden Neurological Institute at Bristol, was talking about "break-off" during lunch at the recent Space Biology Symposium. He is accustomed to flying around at about 2,000 ft. when he can get above the hill lift at Nympsfield; but, he told me, on the one occasion when he got up to 5,000 ft. and qualified for the height leg of his Silver "C," he was rather surprised to find himself experiencing quite a marked attack of "break-off."

It is evidently a relative phenomenon. However much space travellers may suffer from it, they may no more feel "break-off" on coming once more in sight of the earth, still millions of miles away, than a passenger on a cross-channel steamer when the white cliffs of Dover come into view. But why has "break-off" not been reported by sailplane pilots when approaching 40,000 ft. over the Sierra Nevada range in California? Perhaps they have too much to think about.

Dr Grey Walter had also something to say about dolphins, who soar on the bow wave of a ship as skilfuly as a bird does in the wind blowing up a hill. The dolphin, he said, has the most convoluted brain in the animal kingdom, with *Homo sapiens* coming a modest second; moreover, its brain occupies a larger proportion of its body than ours. But why any animal should need a brain like that when it has no use for tools is something of a mystery. Maybe the dolphin has invented bow-wave soaring by sheer use of its intelligence, unlike the albatross, which soars in the first lee-wave behind the same ship without the slightest understanding of why it is there.

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THOUGH the contents of the Soaring Society of America's 1960 Soaring Directory are all in tabular form, it makes interesting reading. Of 49 pages devoted to a list of its 3,000 members in the United States, California occupies 13. New Hampshire, North Dakota and Wyoming come off worst with only two members each; even Alaska has seven. Dayton, Ohio, has 30 gliding enthusiasts; 60 years ago it had two—name of Wright.

Sailplanes in the U.S. number about 1,000. Of these about 750 are registered and 200 under construction. The rest are listed as unregistered or "existence not confirmed"; one of the owners in this group is a Mr. Van Winkle. There are 109 "soaring organizations and clubs," and 16 "soaring schools and commercial sailplane operators."

Holders of certificates number 400 Silver "Cs," beginning with the late Jack O'Meara (who pioneered the Elmira site); 95 Gold "Cs," beginning with Robert Stanley; and 16 with three "Diamonds," beginning with John Robinson.

Among 12 special committees of the S.S.A. are an Air Space Committee, a Research Committee, and a Youth Air Education Committee. A rather intriguing list is of "S.S.A. State Governors," one to every State except Kentucky, which somehow manages without one.

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AN unofficial African record for altitude in clear-air thermals was put up on Sept. 4 by Tony Ridout, of the Salisbury Gliding Club in S. Rhodesia, who climbed from 500 ft. to 16,800 ft. in a Spatz. He missed his 5,000-m. height "Diamond" by 100 ft. It would be interesting to know if anybody ever secured a height Diamond otherwise than in a cu-nim or a wave.

The Sheriff of Norwich, who is our Alf Warminger, is teaching the Lord Mayor of Norwich, Mr. Alfred Nichols, to glide.

Instructors' courses at Lasham for next year have been fixed; they begin on Apr. 9 and 16 and Sept. 3 and 10, and last a week each.

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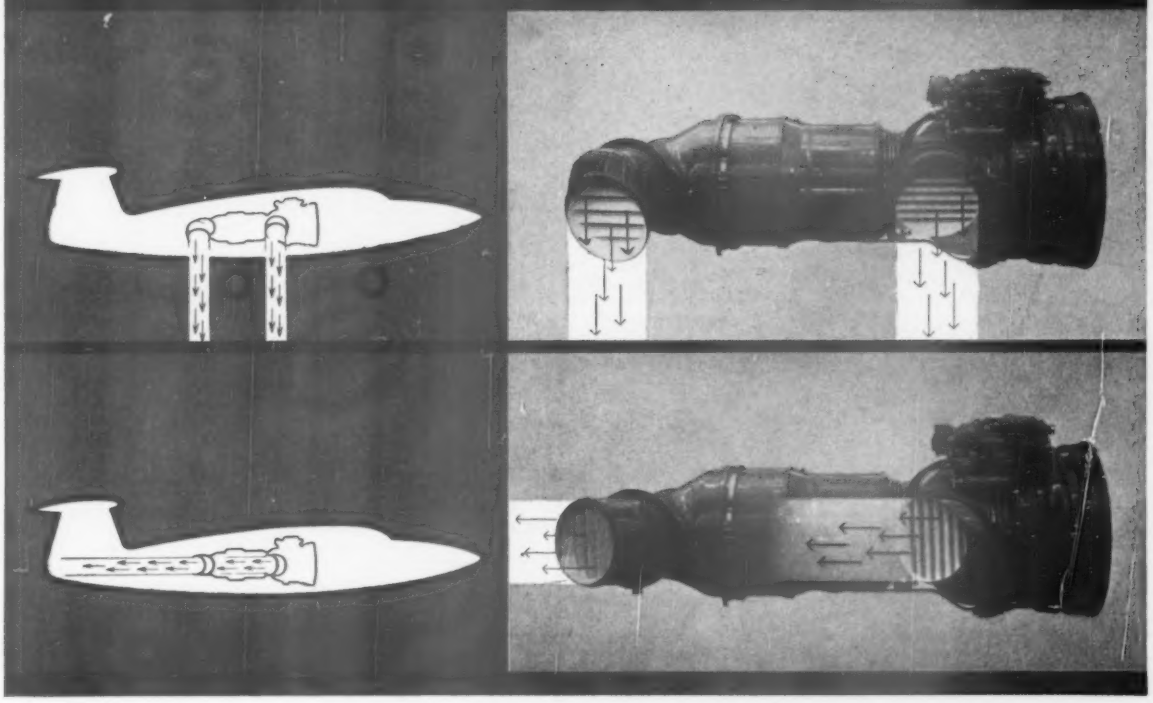
LECTURES on Meteorology and Soaring Flight are being given on alternate Thursdays at the Kronfeld Club (Basement, 74 Eccleston Square) by C. E. Wallington of the Met. Office. An introductory one has already been given; the next are on Oct. 20 (jet streams, fronts, sea breeze), Nov. 3 (tephigram, thermals, convection storms), Nov. 17, Dec. 1 and 15. In the New Year there will be a similar course on "Meteorology and Navigation," starting Jan. 12.

LIFT and THRUST from ONE ENGINE— the Revolutionary BS 53 Turbofan



...ANOTHER ENGINEERING ADVANCE BY BRISTOL SIDDELEY

The new Bristol Siddeley BS 53 high-ratio turbofan represents a major engineering breakthrough in the field of aircraft propulsion. Because the BS 53 can be fitted with movable nozzles evenly disposed around the centre of gravity which give directional control to its total thrust, this remarkably versatile engine provides the airframe designer with a *single power source for all conditions of flight.*

VTOL, STOL and normal take-off capability in the same aircraft. Suitable for subsonic or supersonic applications.

High cold-flow ratio gives high thrust for low weight, low fuel consumption and low noise level.

Conventional installation. Operational simplicity. Independent of all fixed ground installations.

Problems of ground erosion, recirculation and ingestion of debris reduced to a minimum.

The Bristol Siddeley BS 53 has already been selected for the Hawker P 1127 VTOL light strike fighter and is supported by the Mutual Weapons Development Programme for NATO.

BRISTOL SIDDELEY ENGINES LIMITED

HAY. . .

A meadow—
of no military significance.
Not far away a vital military area.

. . . PRESTO!

A convoy arrived
Thunderbird deployed in less than an hour.
The defence requirement changed
Thunderbird moves rapidly to where next needed
A meadow remains

The English Electric THUNDERBIRD is :
The standard Army A.A. guided weapon
Completely mobile
Easily assembled and serviced
Being developed with C.W. techniques
to extend low level range and now in an
advanced stage of development.

'ENGLISH ELECTRIC'
THUNDERBIRD

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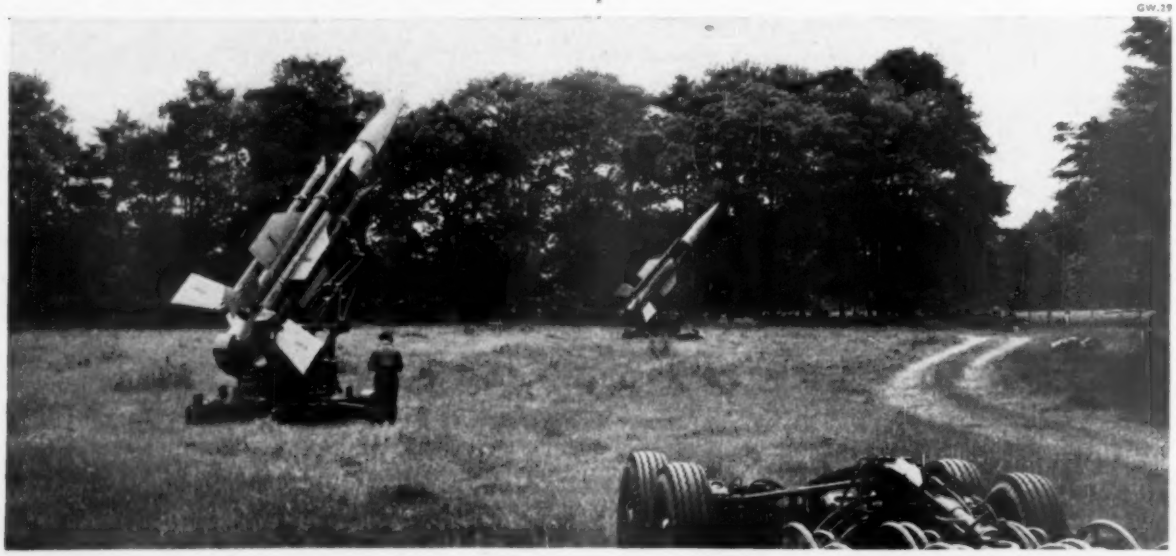


Correspondence

The Case for Kerosene

YOUR report of the Electra accident in THE AEROPLANE AND ASTRONAUTICS of Sept. 23 suggests that the airport fire brigade played a prominent part in getting the 76 occupants out before the fire grew to overwhelming proportions. In this respect your report differs from all others I have read. My guess is that in the circumstances of this crash, the brigade would not have arrived until evacuation of the occupants was well under way. Is your source of information quite reliable concerning this particular point?

My interest in this accident stems from the part I am playing in the "jet fuel controversy." It would appear at first sight that this latest accident has provided another classic demonstration of the case for kerosene.

Harpenden, Herts. J. W. RICKARD.

[Agreed that the evacuation was undoubtedly "well under way" before the fire tenders arrived, our information at the time of going to press suggested that the latter were more than usually prompt in tackling the blaze. It is, of course, the fact that there was a blaze at all, and not the efficiency or otherwise of the fire fighters, which helps to make Mr. Rickard's point.—ED.]

Storm in a Tea-cup

OH, shame squared! Wren, to write in THE AEROPLANE AND ASTRONAUTICS for Sept. 30 that it was a Sandringham flying-boat that was converted into a tea-room. The truth is that it was a flying-boat with a far greater claim to fame, namely "AOTEAROA," one of the Empire flying-boats.

She was converted into a café at Mission Bay, Auckland, after her withdrawal from T.E.A.L. service on Nov. 7, 1947. She remained there until being sold for scrap several years ago.

Belfast, N. Ireland. R. PARSONS.

[Wren is temporarily in a castle in Spain, but no doubt when he reads this he will answer it in his column.—ED.]

Inaccurate Documentaries—1

IN presenting technical documentary programmes such as "The Flying Years" to millions of receptive viewers, one feels that the B.B.C., of all people, should get their scripts vetted by people who know the facts and are aware of the prime need for accuracy in this sort of history. My sympathies in this case are entirely with Sir Alan Cobham, who was inveigled into putting out such canards as "Gustav Hamel was a German" (that's an old chestnut) and "Santos Dumont was a European" (tell that to the Brazilians!).

When we see wonderful shots of the Handley Page O/400 being bombed up at Dunkirk by the Royal Naval Air Service in 1917—thanks to the Imperial War Museum film library—and then are told that it was not ready for participation in that particular war, I frankly give it up. In the same context as the description of the early flying at Hendon we see shots of the Breguet all-steel biplane and the Bristol Coanda monoplane flying serenely against the unmistakable backcloth of early Brooklands track and St. George's Hill, this and much more.

No doubt Sir Alan will be on his home ground when he gets to his own trail-blazing across the Empire (now Commonwealth) air routes and to that we look forward. Meanwhile, all power to the new Historical Section of the Royal Aeronautical Society, who one feels sure, will look after, and strive after, historical accuracy.

Woking, Surrey. C. F. ANDREWS.

Inaccurate Documentaries—2

HAVING looked forward eagerly to Sir Alan Cobham's television programme on Oct. 4 and expecting for once to hear an accurate commentary on the historical films to be shown, I was upset not so much by the usual inaccuracies that we have almost come to accept, but that these inaccuracies should be present despite the list of august aeronautical organizations shown at the end of this programme as having contributed.

Surely there is a great danger in inaccurate documentary presentations of this kind? Many interested viewers will take the same attitude as my long-suffering wife; facts supported by such authorities must be right and the enthusiastic amateur historian must be wrong. This being so, when family connections with those days die out in the next few decades, we shall be left with a legacy of confused and inaccurate expert opinion.

A brief list of the more obvious mistakes is attached*.

Welwyn Garden City, Hertfordshire. GEOFFREY BUCK.

[* If other readers concur and will send in their lists (at the end of the four-week series) we will present a co-ordinated list so that the television people can make appropriate correction.—ED.]

Tell-tale Tails

WREN'S depressed spotting friend who asked how to tell a Boeing 707 from a DC-8 should have got a better answer—such as the one I had from a member of your staff some time ago when I popped the same question.

The DC-8's fuselage sticks out behind the tailplane and this is the most obvious difference from the ground, for the 707 rather seems to trail its tailplane behind it. Additionally, the trailing edges of the inner wings are different, the 707 having curved fillets while the DC-8 is chopped off squarely.

I did not ask about the Convair 880!

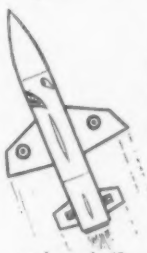
London, E.C.1. R. A. B. COOK.

Twins or Quads?

AS Wren tells us there are only minute differences in outward appearance between the Boeing 707 and DC-8, it would seem they are identical twins—if a four-engined job *can* be a twin!

London. W.14. GEOFFREY DORMAN.

Aroundabout



Pause for Preening. Blackburn's P.R. Manager, Mike Byrne, has reminded me that in THE AEROPLANE of May 9, '58, I suggested the name Buccaneer for their N.A.39. I see, too, that I was sickeningly clever about possible abbreviations of the name—"Buchan" (and the 39 Steps to high low-level performance) and the "Buck" (no passing of).

Then Flt. Lt. Robin Brown, R.A.F. Flying College, chronicler of 112 Sqn. history, notes that this column reckoned (Jne. 6, '58) that 112 "was perfectly in line for re-forming as a G.W. squadron and to get its fourth life." Well, it was and it has and I hope C.O. Pete Shaw will slap the famous old shark's teeth decoration on his Bloodhounds, if only to justify my prognostic sketch of two years ago.

*

Oriental Reorientation. Bringing me back to Earth, Mr. J. Quin of Calcutta lightly comments on a recent error—"Although Calcutta's airport has gained many a descriptive nomenclature from both traveller and aircrew, I am sure nothing so saintly as Santa Cruz has ever before been attributed to it." But Mr. Quin does observe that I was "careful not to tread on anyone's dhoti." And I *did* say that I was sari.

*

Wreader Service. The sponsor of the Save-Our-Sunderland project mentioned here two weeks ago is Mr. P. F. M. Thomas, Pantgwyn, Cardigan, West Wales, to whom please send your comments and contributions.

*

Errornautics. It was bound to happen. Now the *S.B.A.C. Press Summary* has done it, called this magazine *The Aeroplane and Aeronautics*. No harm done, of course, but that other publication, *Slight* or *Blight* or *Plight* or whatever it's called, must be in constant trepidation about somebody mucking about with its name.

*

The Cuba Route. *The Daily Telegraph* reports: "Dr. Castro and 32 of his companions flew from New York to Havana today in an Ilyushin 18-seat plane." Faced with that kind of competitive capacity, airlines ordering new equipment cannot be blamed if in order to get out of the red, they get in it.

by Wren

Industry Record

Strip Mill Expansion

Aluminium plate up to a maximum width of 138 in. can now be produced at the Rogerstone Works of Alcan Industries, Ltd., formerly the Northern Aluminium Co., Ltd. This has become possible with the recent completion of the first half of a four-year £8-million expansion programme for the company's continuous strip mill.

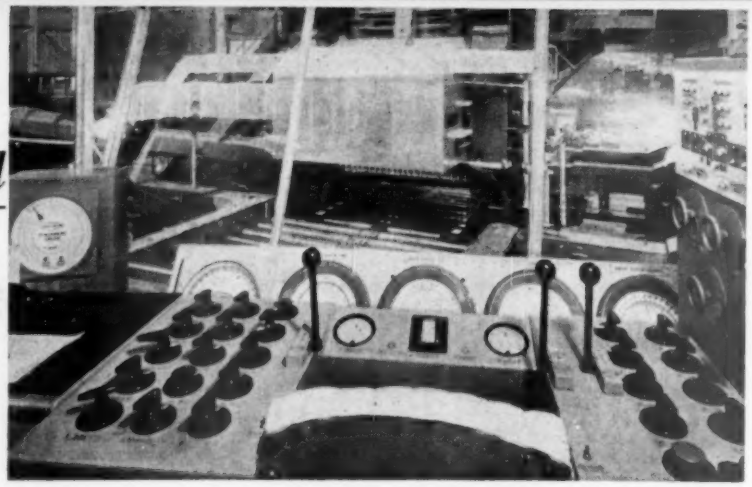
Laid down in 1949-50, the original mill has been improved by the installation of new equipment, the modernization of some existing plant to increase operating speed and versatility, and the relocation of certain facilities to improve the flow of production. This has brought about an increase of approximately 50% on the nominal annual capacity of the mill, which is now 75,000 tons.

The greater proportion of this output is material made from the stronger aluminium alloys, which can now be produced up to the increased maximum width of 138 in. and at lengths of up to 50 ft. by a new 12-ft.-wide hot mill. The largest and most important item of equipment to be installed under the development scheme, this hot mill completes the facilities for the production of wide plate at Rogerstone. The other units, a 4,000-ton plate stretcher, a plate saw and a 50-ft. ultrasonic inspection tank, have been in use since 1958.

In addition to meeting the overall need to increase the volume of production at the mill, the expansion programme has also been brought about by the increasing demand for high-strength plate by the aircraft industry. This has been caused by the adoption of integral construction in aircraft design and at the present time Noral plate is being used for the Vickers Vanguard, the VC10 and the Blackburn Buccaneer.

Apart from the production of wide plate, the new 12-ft. hot mill is employed in the breaking-down of pre-heated ingots for hot rolling. Installed at the start of the third of a mile hot line, which now includes a 96-in. breaking-down mill and an 88-in. hot-finishing mill, it is replacing an 84-in. mill.

Between the new mill and the point at which the original hot line started, other equipment has been installed to shear and handle the wide plate. A new ingot tilter has been fitted to the new mill to load ingots from tunnel furnaces for rolling while the plate just rolled is being sheared and lifted from the tables.



The operator's view of the new Alcan Industries 12 ft. strip mill at Rogerstone.

The feed tables to the mill collect ingots from a new pre-heat bay.

The 12-ft. mill is driven by two 4,000 h.p. DC motors, each linked to one work roll by a forged-steel spindle. The control cabin is set beside the entry tables and all operations are recorded on large dials set at low level on the operator's line of sight to the mill. When plate is being rolled, its thickness is automatically indicated by a Gamma-ray gauge located on the outgoing side of the mill.

There is also provision on the mill and in the control cabin for closed-circuit television to show the far side of the mill to the operator.

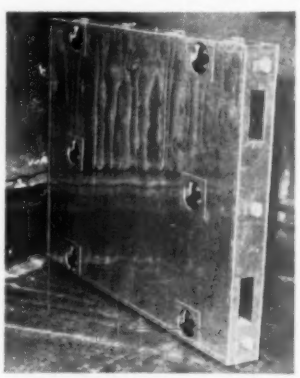
The remainder of the 12-ft. mill bay houses new roll-grinding equipment. This is designed to grind the 12-ft. mill rolls without removing their chocks, but it can be used for any roll in the Rogerstone Works. The complete bay is served by a 125-ton crane which is employed for plate handling and maintenance work.

In addition to being a breaking-down mill, the 96-in. mill now acts as an intermediate roughing mill and handles longer slabs than before. The edge trimmer, at present situated immediately in front of the hot-finishing stand, is to be moved to the position on the line which will be vacated by the 84-in. mill, where it will edge-trim slabs of up to 200 ft. in length.

From the hot line coils are transferred to the cold line for rolling to the finished thickness. With the harder alloys, one or more reductions in the cold mill are followed by annealing and final temper in a temper mill. The annealing furnaces are included in the cold-mill bay, and the equipment is completed by an edge trimmer and slitter.

A Collapsible Pallet

Of particular use in passenger aircraft which have been converted to freight carrying, the King collapsible pallet has recently been completed in prototype form. Constructed conventionally from aluminium alloy sections employing lightweight honeycomb panels, the pallet incorporates a series of castoring rollers in recesses. An integral pneumatic system, operated by foot pump or a built-in pump, provides for these castors to be extended, so that the loaded pallet



can be wheeled across the apron to the aircraft, and moved about inside the aircraft.

Operation of a relief valve then collapses the rollers, leaving the pallet load evenly distributed over the aircraft floor. Estimated weight of a pallet measuring 4 ft. by 5 ft., suitable for a 1,500 lb. load, is about 60 lb. including eight rollers. The pallet is produced by King Aircraft Corp. of Glasgow.

Aviation Calendar

Oct. 15

Halton.—R.Ae.S. Luton Branch lecture, "History and Development of Martin Baker Ejection Seats," by Wg. Cdr. J. Jewell, at 18.00 hrs.

Oct. 17

Derby.—British Interplanetary Society Midlands Branch lecture. "The Planet Jupiter," by W. E. Fox, in the Seven Stars Inn, King Street, at 19.30 hrs.

Oct. 18

Bournemouth.—Guild of Air Traffic Control Officers 3rd Air Traffic Control Convention at the Town Hall; until Oct. 19.

Oct. 19

Southend.—R.Ae.S. Branch lecture, "Rocket Engines," by L. S. Snell, in Room 3, Engineering Dept., Municipal College, London Road, at 19.30 hrs.

London.—The Kronfeld Club Annual General Meeting, at 74 (Basement) Eccleston Square, S.W.1.

Oct. 20

London.—Guild of Air Pilots and Air Navigators lecture, "Aspects of Instrument Development for All-Weather Operation," by Mr. A. M. A. Majendie, M.A., A.F.R.Ae.S., F.I.N., at Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1, at 18.45 hrs.

Oct. 25

London Airport Central.—Institute of Transport West Middlesex Group lecture, "Economics of the Peak in Air Travel," by Garret Fitzgerald, in the Conference Room, 3rd Floor, Control Tower, at 18.30 hrs.

Glasgow.—R.Ae.S. Branch lecture, "Evolution of Airlines," by A. Williams, at the Engineering Building, University of Glasgow, at 19.30 hrs.

Oct. 26

Bristol.—British Institution of Radio Engineers South-Western section lecture, "Radio Aids for Automatic Landing Developed by the Blind Landing Experimental Unit," by J. S. Shayler, at School of Management Studies, Unity Street, at 19.00 hrs.

London.—Kronfeld Club talk by Murray Amor of Rhodesia, at the Basement, 74 Eccleston Square, S.W.1.

London.—Institute of Navigation A.G.M., Presidential Address "The Philosophy of Navigation Today," by Wg. Cdr. E. W. Anderson, at the Royal Geographical Society, 1 Kensington Gore, S.W.7, at 15.00 hrs.

Personal Notices

BIRTHS

Bainbridge.—On Sept. 23, at R.A.F. Hospital, Halton, to Gwendoline (*née* Bradley), wife of Sqn. Ldr. B. Bainbridge—a daughter.

Baverman.—On Sept. 26, at St. David's Wing, Royal Northern Hospital, to Helen (*née* Pollard), wife of Flt. Lt. Alan Baverman, M.B.—a daughter.

Davy.—On Sept. 29, at R.A.F. Nocton Hall, to June (*née* Cains), wife of Flt. Lt. T. H. Davy—a daughter.

Keates.—On Sept. 24, at R.A.F. Hospital, Wegberg, Germany, to Beryl (*née* Wells), wife of Flt. Lt. Roland (Peter) Keates—a daughter.

Kelly.—On Sept. 27, at R.A.F. Hospital, Wroughton, to Amelia (*née* Murray), wife of Flt. Lt. John D. C. Kelly—a son.

Lambert.—On Sept. 30, at Crofts Nursing Home, Cheadle Hulme, to Carol (*née* Plascott), wife of Flt. L. John D. Lambert, R.A.F.—a son.

Lucas.—On Sept. 22, at R.A.F. Hospital, Changi, Singapore, to Margaret (*née* Evans), wife of Flt. Lt. G. A. Lucas, R.A.F.—a son.

Sims.—On Sept. 23, at R.A.F. Hospital, Ely, to Stella, wife of Sqn. Ldr. G. N. Sims—a son.

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Adding to the fame of Cassiopeia is "Tychos's star". This star was a particularly brilliant newcomer or nova that appeared near Kappa in August 1572. The famous Danish astronomer Tycho Brahé, who did not actually discover the star, made it the subject of special study and wrote a monograph which has come down to us. Already an exceedingly brilliant nova, the star appears to have increased in brightness until, within a few days, it was equal to that of Venus and visible to the eye in broad daylight. It gradually faded and eventually disappeared after seventeen months.

Cassiopeia—the Lady in the Chair and mother of Andromeda—is seen at its best on Spring evenings, low on the northern horizon. In Summer Cassiopeia is ascending in the north-east, in Autumn, almost directly overhead and in Winter descending to the north-west.

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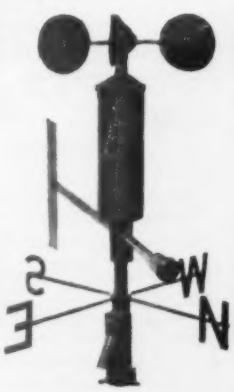

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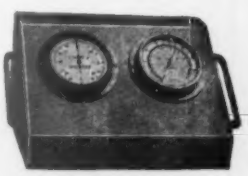

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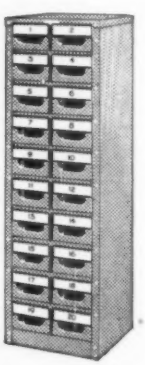

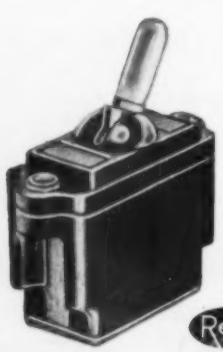

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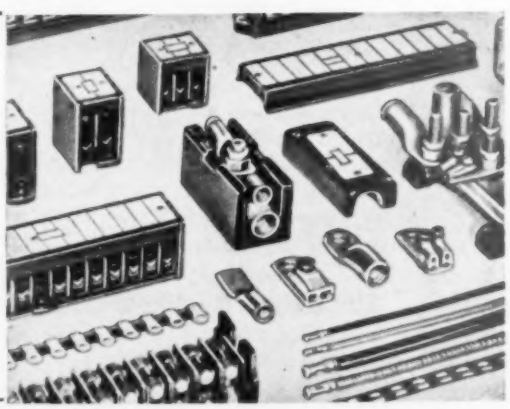

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NOTICES

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM DERBY AVIATION, LTD., OF DERBY AIRPORT, BURNASTON, DERBY:—

APPLICATION NO. 4492 for a Normal Scheduled Service with Dakota aircraft for the carriage of passengers, supplementary freight and mail on the route Derby-Vichy (tech.) and/or Lyons (tech.)-Palma at an initial frequency of two return flights weekly increasing later in accordance with traffic demand for seven years from the date of approval.

FROM AIRLINES (JERSEY), LTD., OF STATE AIRPORT, JERSEY, C.I., for the following Normal Scheduled Services unless otherwise stated initially with Dakota and Heron aircraft and later also with Herald aircraft, for the carriage of passengers, supplementary freight and mail at an initial frequency of three return flights weekly on each service, increasing later in accordance with traffic demand, for seven years from the date of approval:—

APPLICATION NO. 4498 on the route Jersey and/or Guernsey-Amsterdam.

APPLICATION NO. 4499 on the route Jersey and/or Guernsey-Nice.

APPLICATION NO. 4500 for a U.K. Internal Service on the route Jersey and/or Guernsey and/or Bournemouth and/or Manchester-Edinburgh.

APPLICATION NO. 4501 on the route Jersey and/or Guernsey and/or Bournemouth and/or Exeter-Cork.

FROM STARWAYS, LTD., OF LIVERPOOL AIRPORT, LIVERPOOL 24:—

1. For the following service for the carriage of passengers, supplementary freight and mail for seven years from 1961:—

APPLICATION NO. 4495 for a Normal Scheduled Service with Dakota and DC-4 aircraft between Chester (Hawarden) and Dublin at an initial frequency of 15 return flights weekly increasing later in accordance to traffic demand.

APPLICATION NO. 4496 for a seasonal U.K. Internal Service with Dakota aircraft between Chester (Hawarden) and Jersey at an initial frequency of seven return flights weekly increasing later in accordance with traffic demand, from April to October each year.

2. APPLICATION NO. 353/4 for permission to include an optional traffic stop at Chester (Hawarden) on the following services:—

(a) SERVICES ALREADY APPROVED:—

U.K. INTERNAL SERVICES.

No. 353 Liverpool-London.
No. 2383 Liverpool-Glasgow.
No. 2447 Liverpool-Newquay.

NORMAL SCHEDULED SERVICE.

No. 2369 Liverpool-Ostend.

INCLUSIVE TOUR SERVICE.

No. 2100 Liverpool-Santander.

(b) SERVICES APPLIED FOR:—

U.K. INTERNAL SERVICE.

No. 4412 Liverpool-Dundee.

NORMAL SCHEDULED SERVICES.

No. 3596 Liverpool-Dinard.
No. 4413 Liverpool-Cork.
No. 4414 Liverpool and/or Newcastle-Copenhagen and/or Sto.kholm.

"Y" LICENCE SERVICES.

No. 3724 Glasgow and/or Liverpool-Oporto.
No. 3725 Glasgow and/or Liverpool-Palma.
No. 3726 Glasgow and/or Liverpool-Perpignan.
No. 3727 Glasgow and/or Liverpool-Pisa.
No. 3730 Glasgow and/or Liverpool-Malaga.
No. 3731 Liverpool-Rome.
No. 3732 Liverpool-Biarritz.
No. 3733 Liverpool-Tarbes.
No. 3734 Liverpool-Basle.
No. 3735 Liverpool-Munich.

FROM SILVER CITY AIRWAYS, LTD., OF 62 BROMPTON ROAD, LONDON, S.W.3:—

APPLICATION NO. 226/3 for an extension from September 30, 1960, to September 30, 1967, of the period of approval of the Normal Scheduled Service which they are authorised to operate with Dakota, D.H.89, Dove, Herons and Bristol 170 Aircraft between Manston or Lydd and Calais at a frequency of 12 return flights daily and also for permission to operate at a frequency in accordance with traffic demand.

FROM OVERSEAS AVIATION (C.I.), LTD., OF 6 YORK STREET, ST. HELIER, JERSEY, C.I.:—

APPLICATION NO. 2173/1 for an amendment to the terms of approval of the Normal Scheduled Service which they are authorized to operate with Viking aircraft between Liverpool and Paris, at a frequency of two return flights weekly until May, 1961, so as to enable them to extend the period of operation for one year to May, 1962, and to operate the service with Ambassador aircraft.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 556-4

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REGULATIONS to be made under the Civil Aviation (Licensing) Act, 1960, may require the Board to publish from time to time an official record, entitled "Civil Aviation Licensing Notices," containing particulars of certain applications received or proposals made by the Board in connection with air service licences, hearings (including hearings in connection with the advisory functions of the Board under Section 4 of the Act) arranged, decisions made, hearings of appeals arranged by the Minister of Aviation and the Minister's orders on appeals.

THE Board is unlikely to publish these particulars generally, other than in the official record.

APPLICATIONS from persons wishing to receive the official record should be made in writing to the Secretary, Air Transport Licensing Board, 3 Dean's Yard, Westminster, London, S.W.1. Applicants should state the number of copies of each issue required. 556-2

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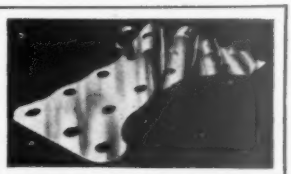

INDEX TO ADVERTISERS

Name	Page
A	
Adcola Products, Ltd.	40
Aero-Enterprises (Boreham Wood), Ltd.	39
Airline Air Spares, Ltd.	39
Airwork Services, Ltd.	42
Attewell, B., & Sons, Ltd.	42
Automotive Products Co., Ltd.	37
Avery-Hardoll, Ltd.	30
B	
Blackburn Engines, Ltd.	31
Boeing Airplane Co.	1
Box No. A561	42
B.P. Aviation Services	22
Bristol Siddeley Engines, Ltd.	33
British Aviation Insurance Co., Ltd.	36
British European Airways Corporation	41
Britool	36
Bryans Aeroquipment, Ltd.	18
C	
Canadair, Ltd.	5
Cross Manufacturing Co. (1938), Ltd.	41, 42
C.W.C. Equipment, Ltd.	38
D	
Dunlop Rubber Co., Ltd.	40
E	
Ekco Electronics, Ltd.	12
Elliott Bros. (London), Ltd.	38
English Electric Aviation, Ltd., Guided Weapons Division	34
English Electric Co., Ltd., The (Aircraft Equipment Division)	25
Esso Petroleum Co., Ltd.	26, 27
F	
Ferranti, Ltd.	4
Firestone Tyre & Rubber Co. Ltd.	2
G	
Graviner Manufacturing Co., Ltd.	36
H	
Hawker Siddeley Aviation, Ltd.	Front Cover, 24, 41
H.M.L. (Engineering), Ltd.	6
Houchin, Ltd.	14
Hymatic Engineering Co., Ltd., The	3
I	
International Aeradio, Ltd.	18
K	
King Aircraft Corporation	37
L	
Lake & Elliot, Ltd.	16
M	
Marconi's Wireless Telegraph Co., Ltd.	29
Martin-Baker Aircraft Co., Ltd.	35
Mercury Truck & Tractor Co., Ltd., The	Inside Back Cover
Munro, R. W., Ltd.	37
N	
Nord-Aviation	11
Northrop International, A Division of Northrop Corporation	7
P	
Palmer Aero Products, Ltd.	13
Phillips & White, Ltd.	38
Plessey Co., Ltd., The	28
Power Auxiliaries, Ltd.	15
Pyrene, Ltd.	19
R	
Rellumit (London), Ltd.	9
Rochdale Metal Products	38
Rotax, Ltd.	32
Rye, Claude, Bearings	41
S	
Sangamo Weston, Ltd.	12
Shell Aviation Services	21
Short Bros. & Harland, Ltd.	42
Solartron Electronic Group, Ltd., The	Inside Front Cover
Spurlings, Ltd.	16
Standard Telephones & Cables, Ltd.	8
Stream-Line Filters, Ltd.	17
T	
Thermionic Products (Electronics), Ltd.	10
V	
Vickers-Armstrongs (Aircraft), Ltd.	23
Vigors Aviation, Ltd.	39
W	
Wayne Tank & Pump Co., Ltd.	14
Westland Aircraft, Ltd.	20
Wiggin, Henry & Co., Ltd.	Back Cover

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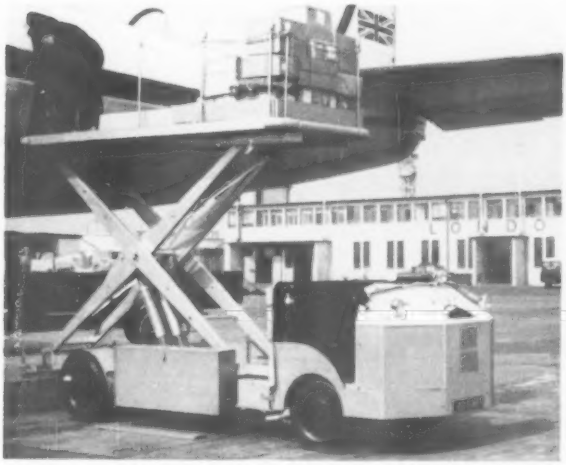

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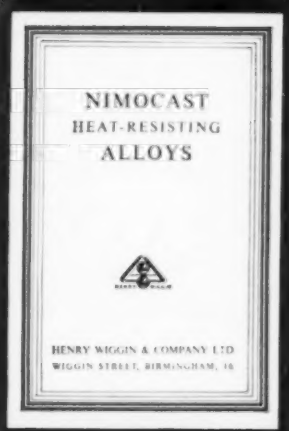

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